WORK

An Illustrated Journal of Practice and Theory

FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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VOL. IV.—No. 172.] SATURDAY, JULY 2, 1892. [PRICE ONE PENNY.

WORK WORLD.

THE French postal authorities are adopting the bicycle for collecting late-fee letters and conveying them to the stations. Where are the British authorities?

* *

An alloy of gold and aluminium has recently been made. Its colour is a most beautiful purple, and it will be valuable in making jewellery.

* *

A tricycle, driven solely by electricity, has also an electric lamp and bell. The inventor travels with it at the rate of four miles an hour, but says it will travel much faster.

* *

It is fairly well known that German husbands wear a wedding ring as well as their wives. Now a London jeweller has introduced a wedding ring for husbands. Whether Englishmen will be content to go about labelled in this way remains to be seen!

* *

Electricity is being used in tempering springs of coiled steel wire. A current of 23 ampères at 45 volts' tension is passed through the spring, and when its temperature has reached the required degree, the current is broken and the spring falls into a trough of water. One man can temper 2,400 springs per day by this method.

* *

An illuminating gas made by mixing carburetted hydrogen or other gas with atmospheric air is thought of. Some private demonstrations of the utility of this mixture have given satisfaction. This mixed gas is stated to admit of being stored for distribution, and to be cheaper than ordinary coal gas.

* *

A new rail coupling-bolt lock-nut is simply a thin metal nut of an escutcheon form. Now, suppose it screws home to the bolt-nut, in a position so that its gravity would unlock it. Take it off and reverse it, and the thread is so cut in relation to the face-bearing as to make it stand out horizontally—so as to gravitate by any jar—to lock the bolt-nut. The English waggon builders used it a century ago.

* *

As a step towards the abatement of the smoke nuisance, a process is nearly in working order which consists in conveying smoke into a chamber where it is well washed with water spray. This causes every particle of soot to be deposited, and at the same time condenses and recovers the ammonia and sulphurous fumes as sulphate of ammonia. The extra cost of this process is more than counterbalanced by the price obtained for the sulphate of ammonia. Londoners, note!

* *

A turner when turning a job that has to be tapered, may be called upon to take out that job for a short time, and bore out a bearing to be parallel. In order that he may save time, he can do this without shifting his headstock, by turning out the front part of the hole to the finished size. Then placing his lathe tool upside down and cutting from the further side of the lathe, he can get a parallel hole. When this is done he returns to his tapered job as before.

* *

A new use for fibre is found in applying it to the manufacture of steam pipes. The texture of the finished pipe is hardened by very heavy hydraulic pressure, and it is claimed that this treatment renders it practically as strong as steel, while it remains comparatively light. It will neither swell nor shrink, rot, or rust. It is a non-conductor of heat, and in its compressed state sufficiently incombustible to render it safe as a material for steam pipes.

* *

Glass-lined tubing can now be obtained in all forms: straight, bends, elbows, and crosses. The internal glass tubing is protected by either cast or wrought iron external tubing, with cement run in to bed the glass solidly. These pipes are made with butt, flanged, and socket joints. Washers of gutta-percha or other suitable material are used to seal the joints. The great advantage of using these pipes for chemicals and other liquids which attack metal is obvious.

Very often engineers wish to fill up unsightly blow-holes in castings in places where these holes do not affect the strength. If lead is poured into them, the lead, when cooling, contracts, and is, therefore, smaller than the hole when cold, and will shake about. What is required is a metal that will expand when cooling, and fill up the cavity tightly. If 9 parts of lead, 1 part of bismuth, and 1 of antimony are used, this alloy will have the desired effect.

* *

A considerable amount of economy is claimed for solidified petroleum. Some recent experiments have proved that 80 gallons of water in a six horse-power tubular boiler can be heated, and steam raised, to 60 lb. pressure per square inch, by 62 lb. of the fuel, in 36¼ minutes, whereas it required 106 lb. of coal and wood to raise steam to the same pressure in one hour. If more extended trials bear out the results now recorded, petroleum fuel should have a prosperous future before it. The property of raising steam rapidly will give it a high value for steam fire engines.

* *

A new lubricator — fibre-graphite — is coming into general use for journal bearings. It is composed of hardwood fibre and graphite. The fibre is reduced to a pulp, graphite is added in a powdered state, and the mixture is subjected to hydraulic pressure in an iron box with several very small holes in the bottom. Water is added before pressure is applied, and, being forced through the holes, in its escape causes the wood fibre to take a perpendicular position. As the fibre prevents the graphite from escaping, the latter is compressed between the fibres which are thus coated with plumbago, and the result is a dense mass of fibre-graphite. When taken from the mould the material is in a finished condition, and has a very smooth, satiny appearance. It is then dried in the air, thoroughly saturated with purified linseed oil, and baked in an oven. It is then ready for use. The wood-fibre, in taking a perpendicular position, presents the ends of the fibres to the shaft, thus reducing the wear on the journal. In the form of a journal bearing, fibre-graphite is a solid lubricant, plumbago being one of the best lubricators known. The first few turns of the shaft in a fibre-graphite journal fill the pores of the steel, and also give the shaft a very thin coating of the new material.

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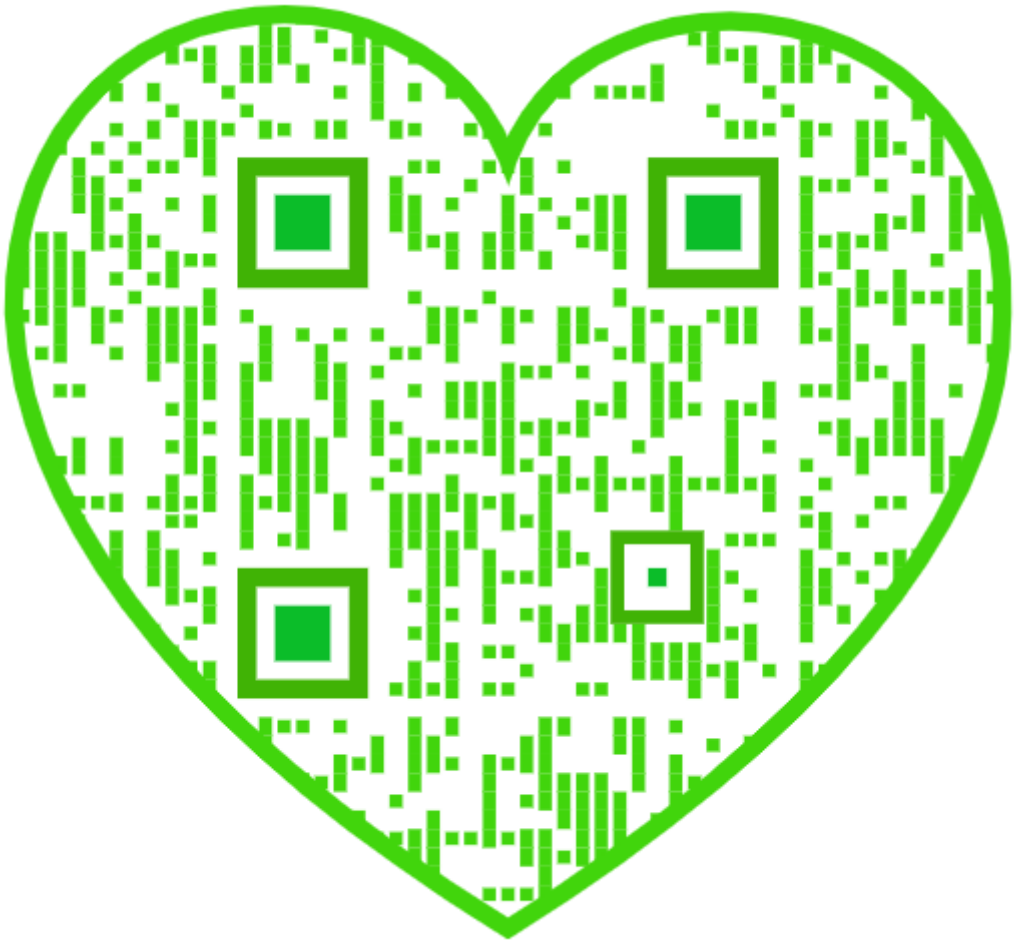

AN EVERY-HOME ICE CHEST OR REFRIGERATOR.

BY ONE WHO HAS MADE IT.

Introduction.—The object of this article is to describe a very easily made and inexpensive refrigerator, which embraces nearly all the latest and best principles of preservation of perishable goods, with a minimum of outlay for ice.

The air of a good refrigerator must be *dry* and *pure*, as well as *cold;* for dampness and varying temperature are principally the causes of decay in meats and fruits.

The objection there is to be found in the so-called "ventilated refrigerators"—where fresh, warm air is admitted from the outside and discharged again just when it has become cold — is that it is this *warm* air that contains the moisture and germs that are so detrimental to the preservation of food, and the process of continually cooling *fresh* warm air consumes a much larger amount of ice than simply cooling the air originally confined in the refrigerator when the door is closed from time to time.

Description.—Fig. 1 is a front elevation. Fig. 2, sectional plan through A A, showing the method of construction, with the ice basket, A, gutters, B, and the zinc-lined shelf on which the ice basket stands. Fig. 3, sectional elevation through C C, showing the circulation of the air in the direction of the arrows. The air in the ice chamber in contact with the cold zinc and ice falls to the bottom, as shown by the arrows, condensing in the ice chamber, which condensation is caught by the drip, shelf, and gutters, and so conducted to the trap, D, and then falls into a receptacle placed for it on the floor under the trap. The cold air, in passing down the trough or space between the false back and the outside, is kept cold by the ice water and condensation continually running along the gutters, and enters the food cupboard at the bottom, passes through the cupboard and around all its contents, and rises to take the place of colder air in the ice chamber; and so on continually, as long as the door of the refrigerator is shut and the ice lasts, it being a well-known fact that cold descends and warmth ascends. Fig. 4, sectional plan, showing slatted shelving and method of constructing door. Fig. 5, perspective view of framework, on which matchlining is nailed. Fig. 6, sectional elevation, through D D, of inside of back, showing direction of gutters.

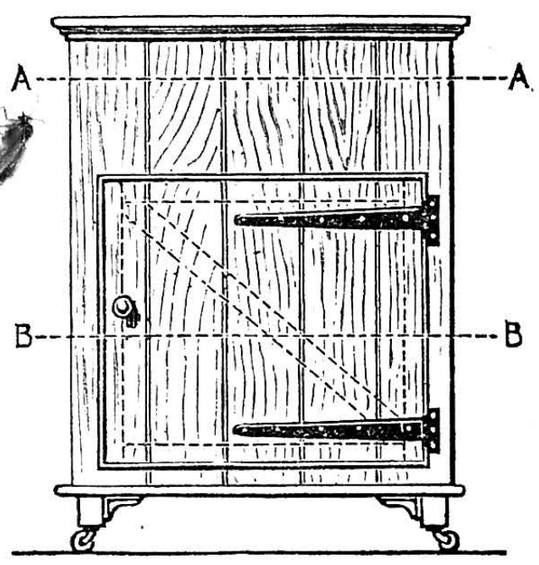

Fig. 1.

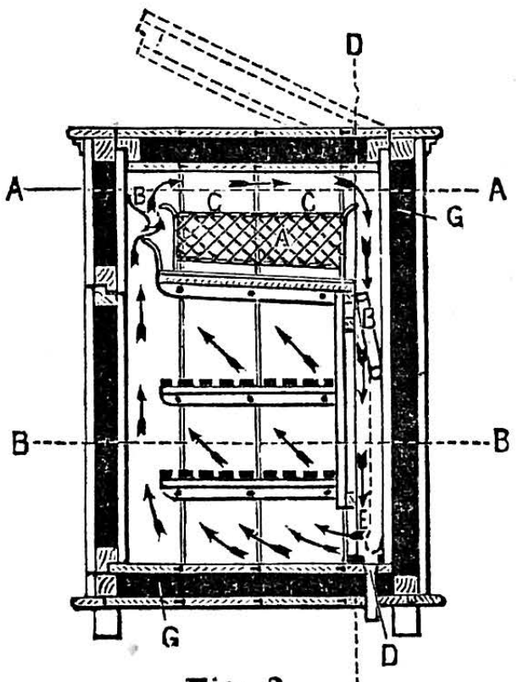

Fig. 3.

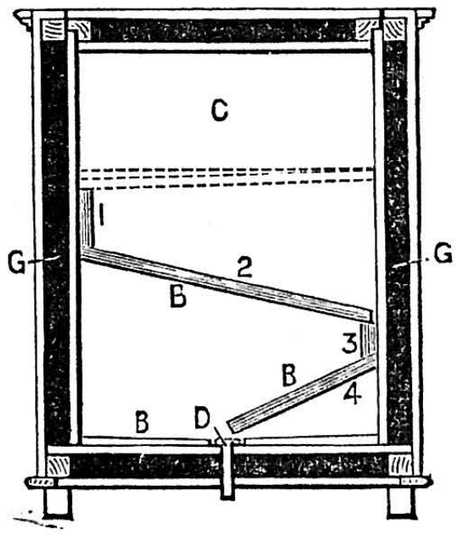

Fig. 6.

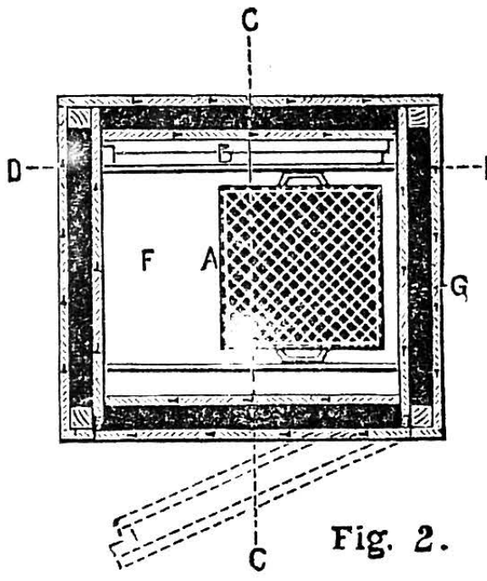

Fig. 2.

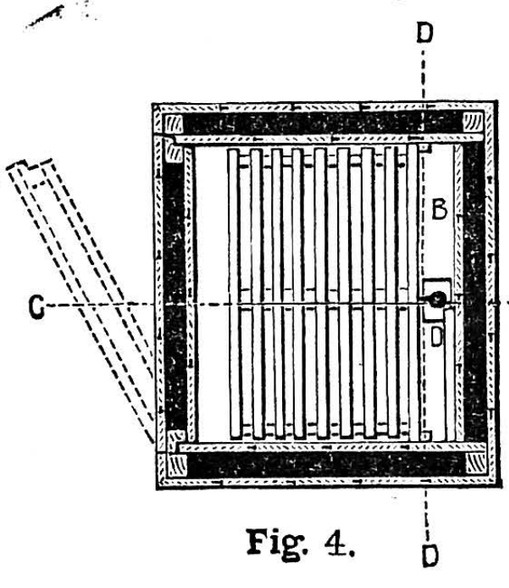

Fig. 4.

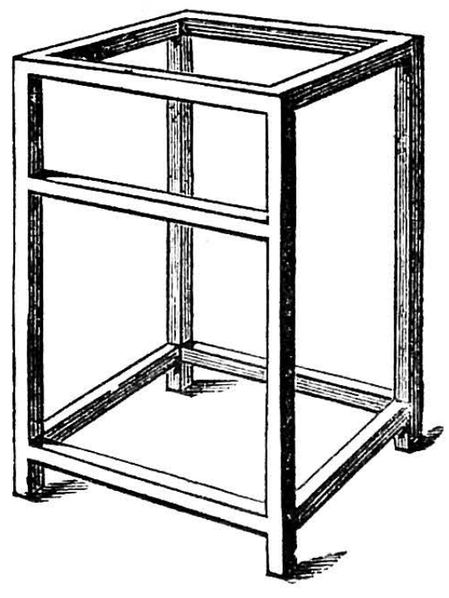

Fig. 5.

Ice Chest or Refrigerator. Fig. 1.—Elevation. Fig. 2.—Plan, A A. Fig. 3.—Section, C C. Fig. 4.—Plan, B B. Fig. 5.—Framework. Fig. 6.—Section, D D. A, Ice Basket; B, Gutters, Drips, etc.; C, Ice or Condensing Chamber; D, Trap to prevent Air getting into Cold Air Trough or Flue and so spoiling Circulation; E, Galvanised Iron Grating to prevent Plates being pushed into Cold Air Flue; F, Space for Water-Cooler, etc.; G, Slag Wool, Charcoal, or other non-conducting Packing.

In order to make the refrigerator as cheap and simple in construction as possible, I do not cover the inside with zinc at all, except the shelf on which the ice cage, A (Figs. 2 and 3), stands, and the little gutters and drips, B B (Figs. 2, 3, 4, and 6). It would certainly be better to cover the underside of the lid—in fact, the whole of the condensing or ice chamber—with zinc; but if the woodwork is well varnished and the gutters and drips screwed tightly to it with brass screws, it is hardly necessary; but on no account should the food cupboard be lined with zinc, because of the condensation of the warm air on the cold metallic surface of zinc rendering the cupboard damp, etc., and this is what it is so necessary to avoid. In a great many refrigerators this zinc lining is simply nailed on to the battens, with very little, if any, space between the outside and the zinc, and with no non-conducting packing between, and, like charity, covers a multitude of imperfections.

Making.—First make the framework as shown (Fig. 5), with 2 in. by 2 in. yellow; this need not be planed, and, as the construction of all these and other various joints have been described so often, I will not stop to describe them. They, of course, would be better properly framed, or mortised and tenoned, but if they are *halved* they will serve every purpose, as the matchlining holds everything together. The inside should next be lined with ¾ in. yellow matchlining, letting the end boards of the sides run by the uprights, and nailed to them, cutting the boards that form the door-stops to the centre of the front uprights. The tops of the boards for the sides should be cut nice and square, and finish exactly in the centre of the top rail of the frame (Figs. 3 and 6).

The bottom should be nailed to the bottom rails first, keeping the front to the centre of the front rail to form stop to door (Fig. 3). On the bottom, between the uprights, battens should be nailed to receive the ends of sides.

Now screw the bearers on to receive the solid shelf (Fig. 3), and the battens to receive the false back. Fit in the solid shelf, allowing it 3 in. narrow, back and front, for circulation of air. This shelf can also be made of ¾ in. yellow matchlining. Make the false back, with battens behind, and fit it into its place, allowing about 3½ in. space at the bottom for galvanised iron grating. By keeping the bottom batten ½ in. below the bottom edge of the matchlined false back, it will form a rebate for the grating later on.

The false back should now be stood on one side, and if it is intended to line the back and sides of air-shaft with zinc, you should now do so. Put sloping pieces of wood on the bottom to form drip to lead water into the trap at D (Figs. 3, 4, and 6); these sloping pieces should be lined with zinc and connected to trap (an ordinary small brass bell trap will do), and turned up 3 in. at the back and two ends (the front need only be turned up about ½ in.), and the thickness of these drips form the bottom rebate for the iron grating. Next line the shelf with zinc, and secure a small piece of zinc guttering on the back edge of the shelf, giving it a slight fall from right to left for the shelf to drain into; turn the zinc of the shelf up 3 in. all round, except the back edge that drains into the gutter. The two sides of the ice-chamber, if decided to be covered with zinc, should have the zinc closely screwed to them along the top edge; if you decide not to line the chamber with zinc, closely screw the turned-up edges of the shelf lining to the sides. The drip, B (Fig. 3), should be screwed along the top edge, and then bent so as to deliver over the back turned-up edge of the shelf, but about 3 in. above it. The small guttering—which, by the way, can be bought at any zinc-worker's—should now be screwed or soldered on to the ends and back as shown at Fig. 6—the short piece, marked 1, arranged with a stop-end on the right-hand end to take the water from the gutter running along the edge of shelf, and delivering into the stopped end of that marked 2, which in its turn delivers into the stopped end of No. 3, and No. 3 into No. 4, and No. 4 into the trap. It might be advantageous, and pay in the long run, to take the carcase in its present state—that is, when it is ready for the zinc—to a zinc-worker's, and get him to do the lining and fixing of the

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gutters. Very thin zinc will do. He could cut you the piece of zinc for lining the underside of the lid, which could be readily screwed on when the lid was made.

Now procure some charcoal or slag wool, and tightly pack the spaces between the framework and proceed to nail the sides on, one side at a time.

The sides would look and be much better if a staff bead were worked up the four external corners, and the angles tongued and grooved together. The sides and door could also be framed with panels and moulded, if desired; but this, of course, must be decided by the maker. What I am endeavouring to explain is how to make the thing easily and cheaply.

The doors are simply made of the same material as the frame, but rebated on the outside to form stops, and the matchlining nailed on inside and out and packed with the non-conducting material. If the rebating presents any difficulty, make the edges perfectly square, less the thickness of the inside matchlining all round, and nail fillets or beads around to form stops.

To hang the door and lid, put them into position, seeing there is sufficient space all round, and keep them away from the body of the case with small wedges driven lightly into the joints, and screw on ordinary cross-garnets; take out the wedges, and the doors are hung.

Next screw the false back into its place; and, as there is very little chance of any drippings or condensation getting on to this, it need not be lined with zinc, even if the rest of the air-flue is.

The galvanised iron grating, or a piece of perforated zinc, may now be secured under the false back, as shown at E (Fig. 3). Now screw on the bearers for the slatted shelves; these shelves are so simple that I shall not attempt to describe them.

The next thing is to nail the nosings round the top and bottom and put the fastenings on the doors (a simple knob and button will do for this), and screw on the castors, if required. The only thing that now remains is the ice basket, and this, I think, I should buy. Any wire basket will do that will go into the space. The whole of the inside, except that portion covered with zinc, should have two coats of hard oak varnish. The outside can be either stained or grained, or left in plain colour; but, whichever way you finish it, it should be varnished.

COST.

	£	s.	d.
Say, 60 ft. 2 in. by 2 in. yellow, at 1d. per foot	0	5	0
1 square of ¾ in. yellow matchlining	0	11	0
Zinc guttering and lining—1 sheet	0	5	0
2 pairs cross-garnets at 1s.	0	2	0
Non-conducting packing	0	5	0
Wire basket	0	2	6
1 bell trap	0	1	4
Fastenings for doors	0	0	9
Jury-grating (galvanised)	0	1	6
4 strong castors	0	3	0
Nails, screws, etc., and paint and varnish	0	5	6
	2	2	7

This cost is the most you would have to give for the materials in any part of the country; in most places I think they could be got for less. Food should be kept fresh and wholesome, and such a chest as described would often repay itself in warm weather by saving a doctor's bill.

HOW TO MAKE AND WORK THE SPECTROSCOPE.

BY CHARLES A. PARKER.

FITTING SPRINGS AND REGULATING SCREW TO HOOD—ADAPTATION OF CLOCK-SPRING BARREL FOR COLLIMATOR HOOD—PREPARATION OF COLLIMATOR BODY TUBE—ATTACHING COLLIMATOR HOOD TO BODY TUBE BY BAYONET CATCH—PREPARATION OF CELL FOR OBJECT LENS.

HAVING already shown the mode of attaching the jaws to the cover of the collimator hood, it behoves us to turn our attention to the preparation of the two springs and milled screw by which the width of the slit is regulated. These springs, which are intended to act upon the extreme corners of the jaws and force them into close contact when shut, have already been illustrated in Fig. 12 (page 151), but the component parts are again shown at A and B in Fig. 17. For each of these springs file up a small block of brass to the size and form of A, Fig. 17, which measures ⅜ in. long and ¼ in. wide by ⅛ in. thick, and when ready drill a hole through the middle of the block and afterwards slit one end of the brass nearly through

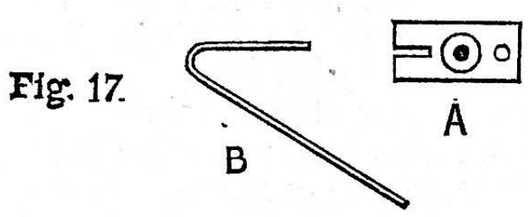

Fig. 17.

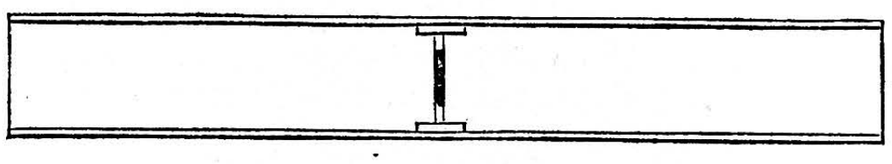

Fig. 18.

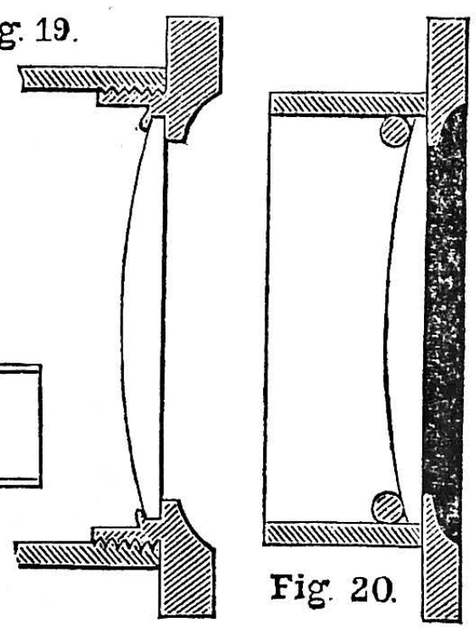

Fig. 19.

Fig. 20.

The Spectroscope. Fig. 17.—Spring for Jaws of Slit. Fig. 18.—Section of Collimator Tube. Fig. 19.—Section of Cell for Object Lens. Fig. 20.—Simple Form of Cell for Object Lens.

to the central hole in order to receive a 1 in. length of steel watch spring, B, Fig. 17.

The spring should be made quite soft in a gas or spirit flame, and then bent to the required form whilst at a red heat, after which it is hammered tightly into the slit portion of the brass block previously made. Thus prepared, the two springs are attached to the discs in the position indicated in Fig. 12 by means of small screws driven into suitable holes drilled and tapped for their reception in the brass disc. As an additional precaution against the possibility of the springs shifting at any time, it will be found advisable to drill a hole close to the screw and fit a small steady pin to each spring.

Before going further it will be necessary to turn to the collimator hood and provide this with a milled screw by which the width of the slit may be adjusted. For this purpose we shall require a milled screw and nut similar to the one shown in Fig. 13 (to be obtained from Messrs. Platt and Witte).

To attach it to the collimator hood, remove the nut from the screw, and then soft-solder this over a hole of suitable size drilled through the side of the collimator hood quite close against the open end of the latter, as will be seen by reference to the illustrations, after which the screw may be screwed into position in order to be certain that it acts with perfect freedom.

In order to complete the collimator hood, a 1⅜ in. hole should be cut through the bottom of it, into which a ½ in. ring of drawn brass tubing (previously trued up in a lathe) is fitted, and then soft-soldered, any solder escaping outside being afterwards cleaned off by an old file, followed up with a piece of emery-cloth wrapped round a strip of wood.

As before stated, the collimator hood can be made from the spring barrel of a disused musical box or clock, which would be found to answer admirably for the purpose without any alteration. A barrel of this description can generally be had for a few pence from a watch and clock maker in any large town.

In the event of a barrel of this class being employed, it should not measure less than 2¼ in. in diameter by 1¼ in. in thickness. If it is a musical-box barrel, it must be mounted in a lathe for all the teeth to be cleared off, and it will also be necessary to soft-solder a ½ in. ring of 1⅜ in. drawn brass tubing into a hole cut for its reception in the bottom of the barrel, in order to form the collar by which it is fitted to the collimator tube, not forgetting the attachment of the regulating screw. The remaining operation of attaching the jaws to the outer cover or cap is also executed in precisely the same manner as I have previously described, and therefore calls for nothing more than a passing mention here.

The collimator hood being by this time completed, may now be placed aside for a short time while the collimator tube is being prepared. This is shown in section in Fig. 18. For this we shall require a 10¾ in. length of moderately stout drawn brass tubing 1½ in. in diameter, which should be trued up at both ends in a lathe, and then provided with a suitable stop. To make this, prepare a ½ in. ring of tubing which will just fit into the tube, and then cut a ¾ in. hole in a small disc of brass, and afterwards reduce this in size to a suitable diameter to allow it to be tightly fitted into the ring just prepared, thus forming a suitable stop which may be pushed into the collimator tube, and fixed in the centre of the latter by means of a small quantity of soft solder run round the ring. The next proceeding will be to make suitable provision for the attachment of the collimator hood to one end of the tubing, and afterwards provide a cell to contain the lens which fits on to the other end of the tube. The former can be readily fitted into the tube by means of a bayonet joint made in the following manner:—At one end of the 10¾ in. tube just trued up, drill a couple of small holes on opposite sides to each other and ¼ in. distant from the outer edge of the metal, and then fit the collimator box on to the end of the tube by means of the projecting collar. Now insert a sharp point through the holes just drilled, and make a couple of marks on opposite sides of the collar while it is in the tube in order to indicate the position of the two holes. This done, remove the collimator hood, and by means of a small square file proceed to cut a couple of L-shaped slots through the sides of the collar, the punch marks serving to indicate the position of the short arm of the slot, which, by the way, should be of

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sufficient width to take a pin of stout brass wire (about No. 10, B. W. G.).

Now insert a pin of the above wire in each hole of the tube with about $\frac{1}{8}$ in. projecting inside, and then cut it off flush with the surface on the outside, and rivet securely. If necessary, the wire may be fixed to the tube by means of a touch of soft solder, but in the ordinary way this will not be needed. It will obviate any annoying mistake if only one bayonet slot is filed first and then filled with its respective pin, as it will then be an easy matter to fit the remaining pin with the greatest degree of accuracy.

If preferred, a screw thread may be chased on the collar of the collimator hood, and a corresponding thread on the inside of the tube, but at the same time it must be said that the above plan of a bayonet catch is much more simple to make and quite as satisfactory in use. When it is desired to attach the hood to the tube, it is simply necessary to insert it in the body tube with the pin passing through the longer arm of the L-shaped slot, when a slight turn will cause the pin to pass into the shorter arm and thus secure it in position.

Next in order comes the cell to contain the collimating lens, which, by the way, should be a $1\frac{1}{4}$ in. plano-convex lens of 12 in. focus. The cell, which is shown in section in Figs. 19 and 20, should have a $1\frac{1}{8}$ in. clear aperture, and may be cast from a suitable pattern, and then turned up quite true in a lathe with a seat of just sufficient diameter to take the lens. In preparing the bed to receive the lens, it will be necessary to turn the upper edges of the seating as thin as possible, with only just $\frac{1}{32}$ in. projecting above the lens, so that it will be a simple matter to burnish the edge of the metal over the lens, and thus secure it in position.

It will require some amount of skill to accurately prepare the seating for the lens in the manner above described, and as it is a rather difficult undertaking for an inexperienced amateur, it may be advisable to describe a more simple plan of making this cell, which is shown in Fig. 20, and will doubtless be preferred by some of our readers.

From a piece of stout sheet brass cut a circular disc $1\frac{3}{4}$ in. diameter; then find the exact centre by means of a pair of compasses, and strike out a $1\frac{1}{8}$ in. circle, which is afterwards cut in a lathe with a countersunk edge. Now procure a bit of tubing which will tightly fit into the end of the collimator tube, and having cut off a $\frac{1}{2}$ in. ring of this, true up both ends in a lathe, and then soft-solder the ring on to the disc just prepared, being particular to see that it is correctly centred.

In order to ensure this, it will be found advisable to mark a circle on the disc just a trifle larger than the diameter of the collimator tube before cutting the central opening. It is almost needless to say the countersunk side of the disc should be on the outside. If any difficulty should be experienced in obtaining a piece of tubing which will tightly fit into the collimator tube, it will be necessary to obtain the next size larger, and then slightly reduce the diameter of the tube by turning it in a lathe or by the judicious use of a file. When the cell is ready, the lens may be dropped in it plane side downwards, being retained in position by means of a ring of brass wire which is sprung into the cell and pushed firmly against the lens. Assuming that the cell has been properly fitted to the collimator tube it will remain in position quite secure without requiring the additional aid of a bayonet joint. The observing telescope will receive description and illustrations in the next article.

BENT IRON WORK, AND HOW TO DO IT.

BY J. H.

Candlesticks.

Bracket Candlestick—Back of Ditto—Candle-Holder — Table Candlestick — Details—Candle-Holder — Table Candlesticks — Bedroom Candlestick.

Candlesticks are not used so much nowadays as formerly; but they are retained for bedroom service; and as they can be made very prettily in bent iron, I propose to illustrate a few forms.

Bracket Candlestick.—Fig. 22 illustrates a bracket candlestick, suitable for screwing-up against the bed's head for reading by. The main framework, A and B, is made of iron rod, $\frac{1}{4}$ in. square in section; the remainder is of thin strips, $\frac{1}{4}$ in. wide. After having drawn out the entire bracket to the size selected as being most suitable and convenient, measure round the curves of A with a bit of string or wire, in order to get the length of rod required. Cut it off and heat one of the portions marked *a a′* to a white heat. Hold the bar at *b* or *b′* with tongs or pincers, and with another pair of tongs turn the bar round and round, and so form the twist, *a*. Repeat this operation at the other section, *a′*. Heat the parts *c*, *c*, for about 1 in. or $1\frac{1}{2}$ in. of length, one at a time, and upset them by striking the end of the bar upon a lump of iron, which will, of course, thicken or dump the metal up at the heated section. Flatten out the metal with the hammer in the width-way of the bar, thus giving it the appearance of Fig. 23, A. Now heat it again, and punch a hole in the centre (Fig. 23, B). The bar will next be bent to the scroll forms shown—*c′*, *c′*, in Fig. 22. It will be raised to a moderate red-heat and hammered gently around the beak of the anvil, or round any suitably curved surface of metal, or even bent with tongs. The bar will be tried from time to time upon the full-sized drawing, and its curves set and corrected with the hammer, until all flats and angularities are removed, and good flowing scrolls obtained.

Back of Candlestick.—The cross, B, is made thus:—Two strips are taken, each, say, 1 in. longer than the total distance, *d*, over the bosses, *e*, *e*. The ends of each are heated in succession to a white heat, and upset by hammering or by dumping down upon the face of a block of iron. They are then spread out sideways with the hammer, and thinned down until they are rudely of the form of the bosses, *e*, *e*, *e*, *e*. But the neat outlines of the latter will have to be imparted with the file. The screw-holes in the centres of *e* will be drilled and countersunk. The bars, B, will be welded at the centre, where they cross each other. They should be upset slightly, and then raised to the welding heat, and struck smartly while laid across each other at right angles, until their faces are flush on both sides. The metal spread out about the centre will be filed off neatly to form a little boss, in the centre of which a rivet-hole, *f*, will be punched or drilled. Through this the rivet, *g*, which unites the scroll, A, to the back, B, will be put. To prevent risk of the scroll turning round on the rivet, the latter must be made very fast, or the hole and the shank of the rivet be filed square, or a little solder run round it.

The bent iron work on the back, B, is made in four similar portions. The separate parts which compose one of the quatrefoils are shown distinctly separated in Fig. 24. There is, first, the central finial, *h*, bent round upon itself, and turned backwards at the ends, to be soldered or clamped to B. To *h* the flanking scrolls, *i*, *i*, and *k*, *k*, are pinched with clips; *k* and *k* are also secured to B adjacent with solder or with clips; *l*, *l*, are fastened to *k*, *k*, with clips, and they may also be further secured to B with solder or with clips.

On the scroll, A, midway between the twisted portions, *a* and *a′*, the ornament, *m*, is fastened. There may be four, six, or eight of these small scrolls arranged equidistantly around the bar, A. They relieve the otherwise naked appearance of the bar.

Candle-Holder.—Lastly, the actual candle-holder is made and fitted into the hole made at *c*. Fig. 25 shows this fitting enlarged in section and in plan. A pillaret, *n*, turned in brass, is fitted by riveting below to A at *c*, and above to the dish, *o*; also by riveting. This dish is made of thin sheet-iron, cut into a conventional floral dentition at the edges and beaten up into a dished or concave form. Upon this the actual holder, *p*, of tin or brass tubing, is secured by means of soft solder.

Table Candlestick.—Fig. 26 shows a candlestick suitable for standing upon a reading-table. There is a centre-pillar, *a*, of rod $\frac{1}{4}$ in. square, and four sets of scroll-work standing at right angles with each other. Three sets also will serve as well, and give less labour. The height of the candlestick may be from 10 in. to 14 in. It should be drawn out to any full size decided on, and the figure can be measured by scale for the purpose. The details of the work are as follows:—

Details.—Beginning at the base, two double scrolls, *b*, *c*, either of thin iron, $\frac{3}{8}$ in. or $\frac{1}{2}$ in. wide, or of that of stouter section, say $\frac{1}{16}$ in. thick—preferably the latter—are turned, and crossed at right angles. A hole $\frac{1}{8}$ in. or $\frac{3}{16}$ in. diameter is punched in the centre of each, and the bottom end of the pillar, *a*, is shouldered into it and riveted over (as at Fig. 27, A). All the rest of the work is of thin iron. There are three main scrolls, *d*, *e*, *f*, in each series. There are also the minor scrolls, *g*, *h*, *j*, *k*, and also the tendril, *l*. These parts separated are seen distinctly in Fig. 27, B; and the positions of the clips are indicated by single crosses. The locations where the curves are mutually clamped to the central rod and base are indicated by double crosses. The tendrils, *l*, are fastened only at *m*, being clamped between *d* and *e*. Beyond that, they simply lie around the curves of *d*.

Candle-Holder.—The dish, *n*, is cut from thin sheet-iron, and is fastened to *a* by riveting *a* through a hole in the centre of *n*. The candle-socket, *o*, made of tin or brass tube, is soldered upon *n*.

Table Candlestick.—Fig. 28 illustrates a candlestick of an alternative design, but of the same general type as the last. As before, there is a central bar, *a*, riveted at bottom to the scrolled feet, *c*, and at the top to the dish, *n*, which holds the candle-socket, *o*. The feet, *c*, should be of stout section, the remainder of thin strips. The scrolls, *d*, *e*, *f*, *g*, are clipped at their points of contact with each other, and also to the central pillar, *a*; and *b*, *b*, are minor scrolls.

Table Candlestick.—Fig. 29 shows another

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alternative design, constructed similarly to the previous ones, but with different dispositions of the scroll-work. The various scrolls in a single series are shown separated

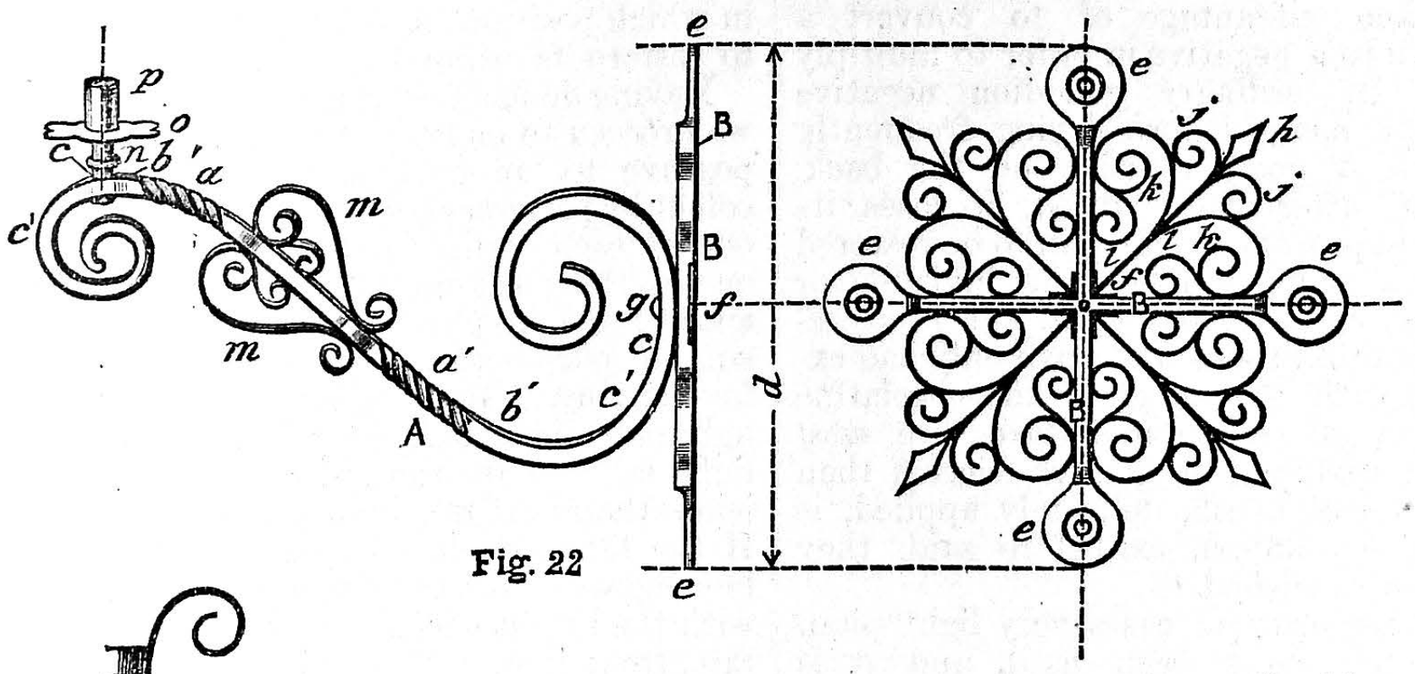


Fig. 22

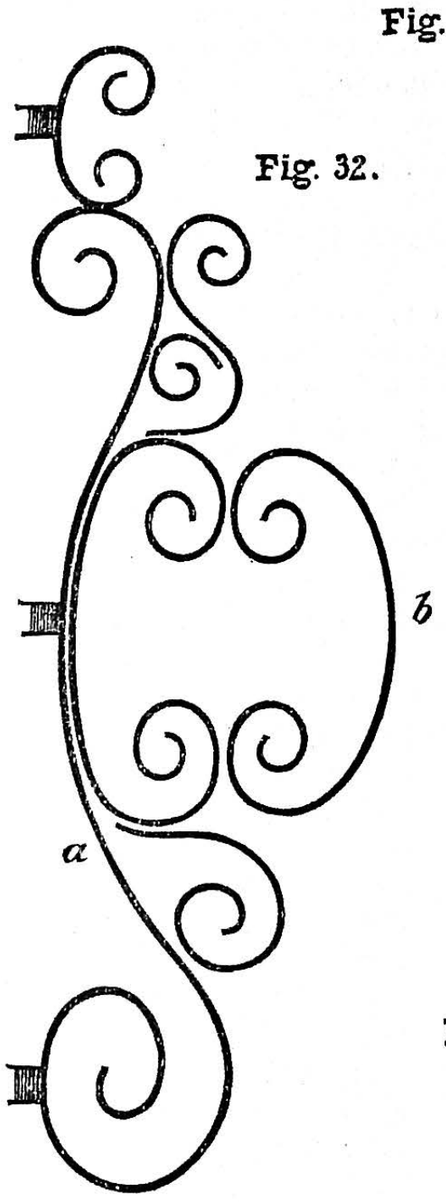


Fig. 32.

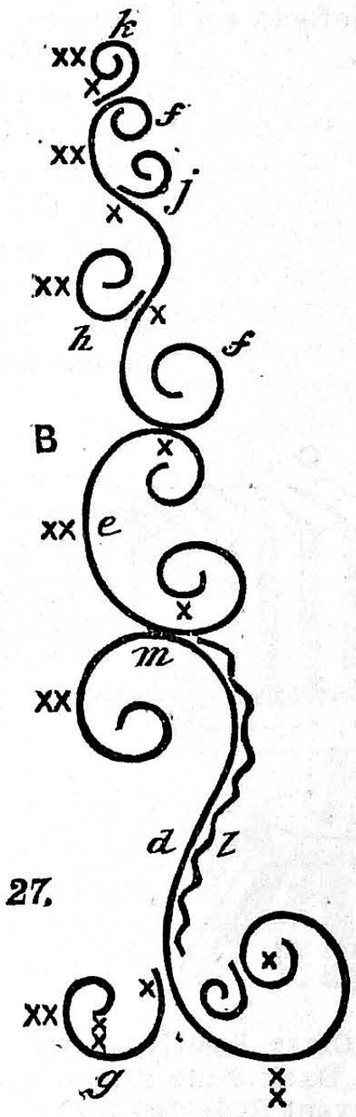


Fig. 27.

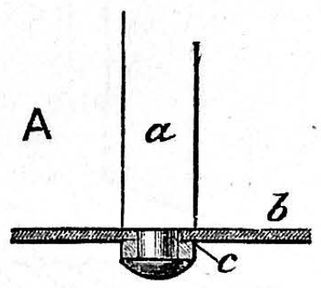


Fig. 27.

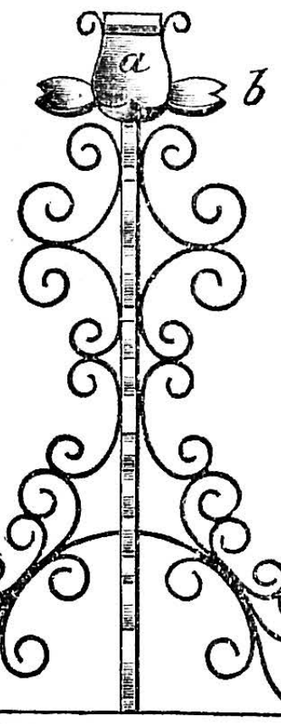


Fig. 29.

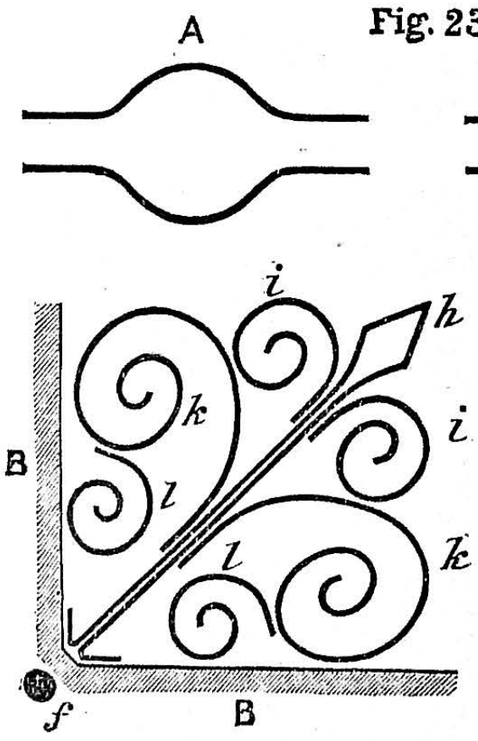
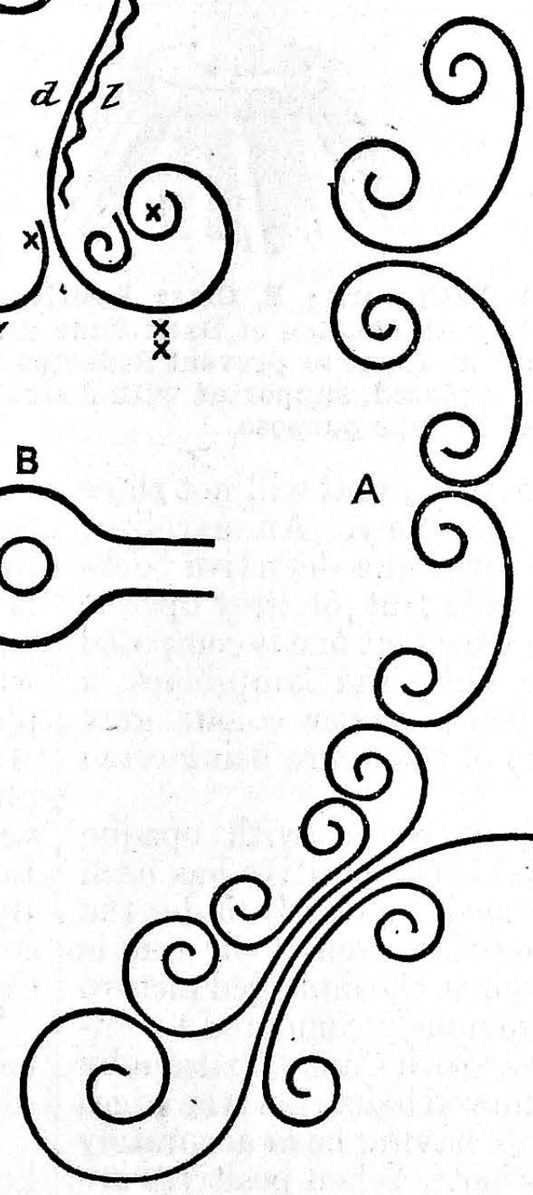


Fig. 24.



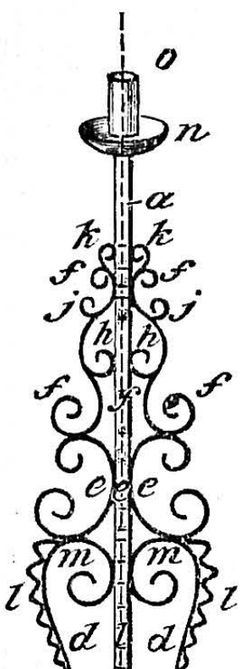


Fig 26.

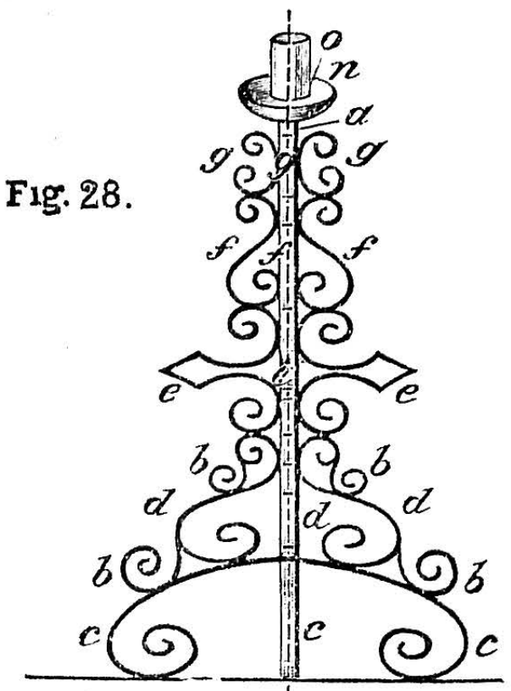


Fig. 28.

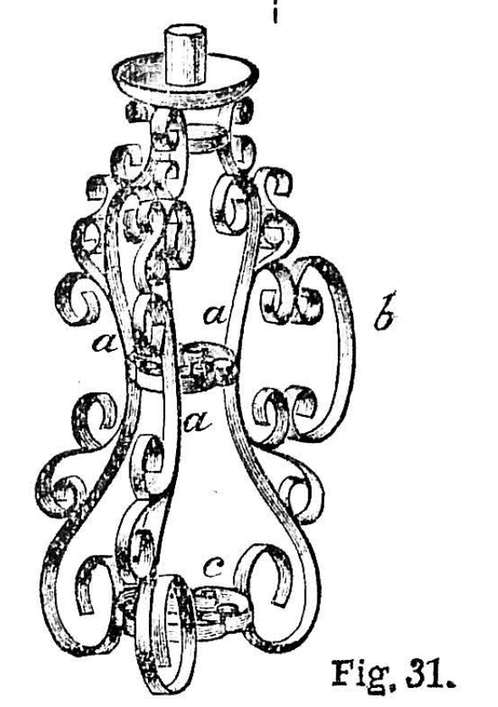
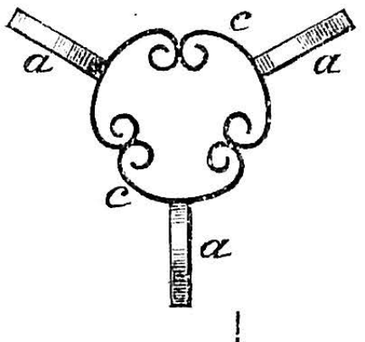


Fig. 31.



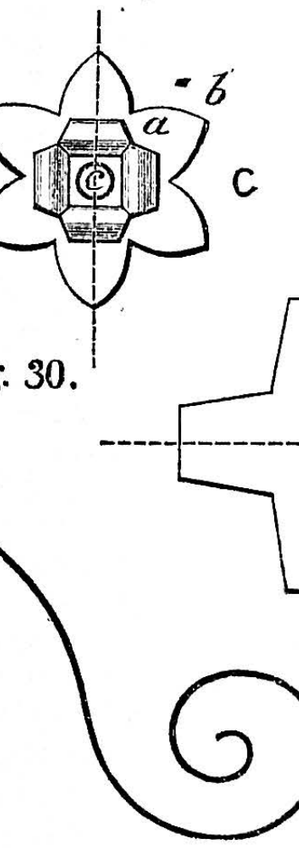


Fig. 30.

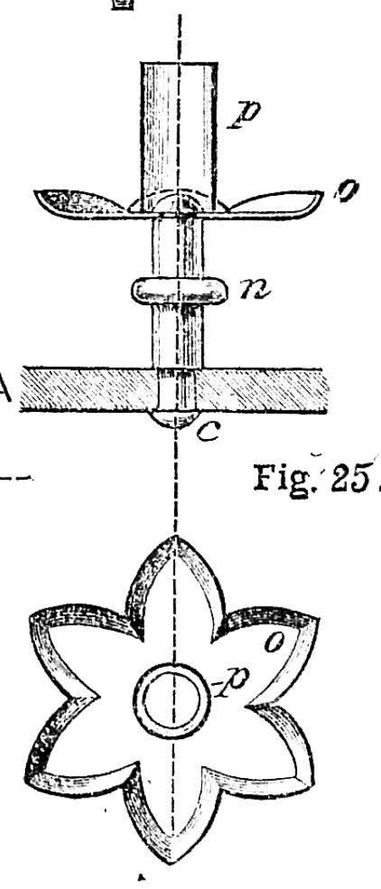


Fig. 25.

Bent Iron Work. **Fig. 22.—Bracket Candlestick. Fig. 23.—Formation of Bosses. Fig. 24.—Detail of Scroll-work with Parts shown separated. Fig. 25.—Detail of Candle-Holder. Fig. 26.—Table Candlestick. Fig. 27.—A, Fastening of Base to Pillar; B, Detail of Scrolls. Fig. 28.—Table Candlestick. Fig. 29.—Table Candlestick. Fig. 30.—Details of Scroll-work with Parts separated. Fig. 31.—Bedroom Candlestick. Fig. 32.—Detail showing Parts separated.**

in Fig. 30, A, and the remarks already offered in reference to fastenings will also apply to this example, so that I need not repeat them. The socket of the candlestick is formed differently from those in the previous examples. It is shown in detail in Fig. 30, B, C. It is cut from a bit of sheet-metal to soldered on to the rosette, *b*, also formed of sheet-metal, and riveted to the central pillar of the candlestick. The head of the rivet is shown at *c* in Fig. 30.

Bedroom Candlestick.—One more example (Fig. 31), and I have done. It is that of a bedroom candlestick, provided with a handle, *b*. In this there is no central pillar: three legs, *a*, provide the necessary support. The legs should be made of iron strips, $\frac{1}{16}$ in. thick; the remaining curves of the thin strips. The disposition of the scroll-work is quite clear from the figures. There is only one handle, *b*. The legs are prevented from spreading, and kept steady by means of a top ring, and two rings of double curves. The lower series, *c*, is shown in plan below. These curves are united to

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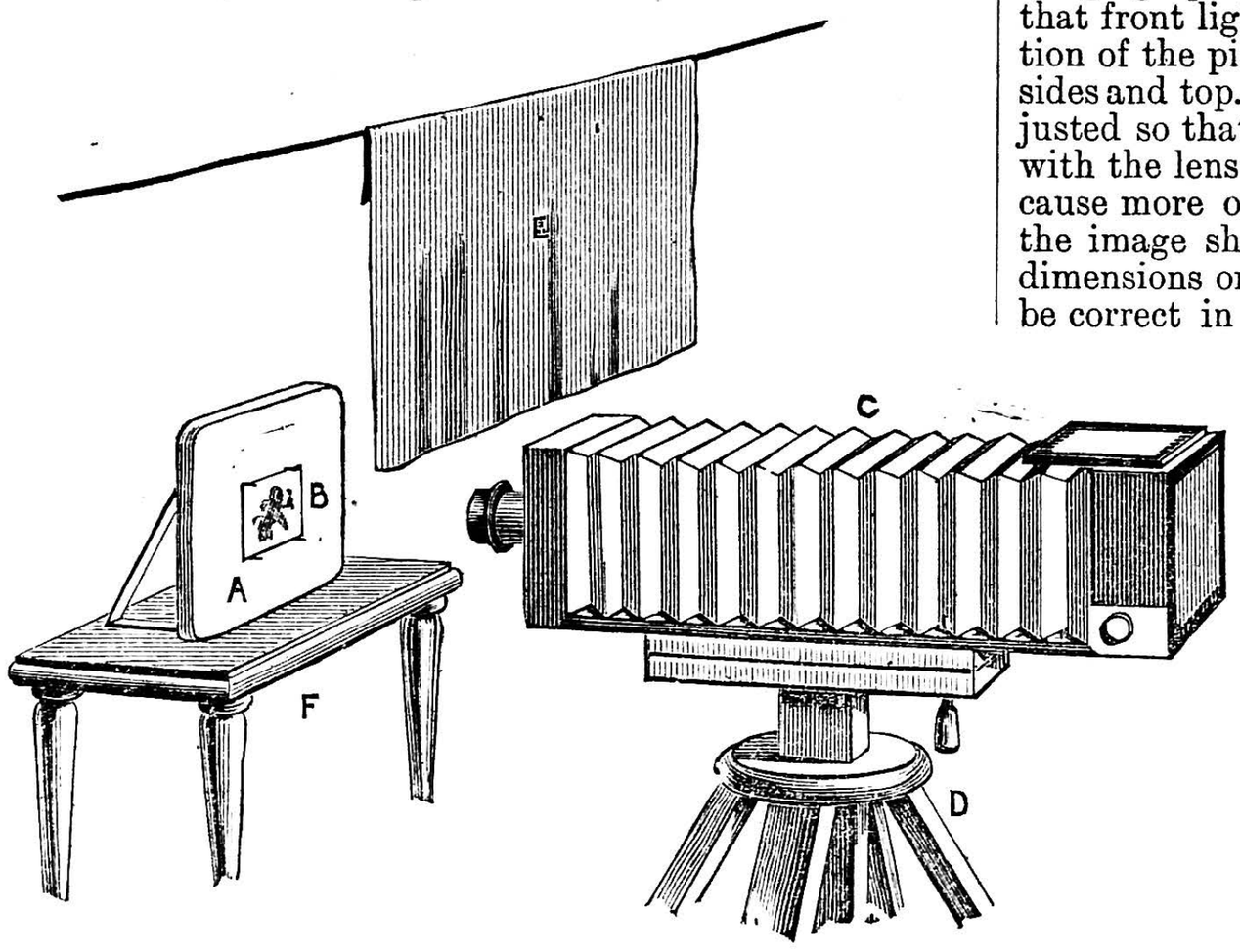
each other with clips, and to the legs with crossing wire. Fig. 32 shows the detail of one leg—the one which carries the handle, *b*.

HOW TO COPY GLASS POSITIVES.

BY AN OLD HAND.

When the amateur has occasion to copy a glass positive he would probably like to know the best manner of doing it, and as the method differs in many particulars from that adopted in copying an engraving or picture of any other description, we purpose to point out where the differences lie, and the precautions to be adopted to secure a successful result.

Let us suppose the positive is in our hands, and we desire to make a copy the same size. Prior to setting to work, we must examine it carefully before deciding on our method of procedure, which will have to be varied according to circumstances. We first notice the state of preservation of the positive picture, and remedy defects as well as we can. The principal defects will probably consist of dirt and scratches, or it may be the portrait is broken in pieces; or, on the contrary, it may be a perfect example of positive work. Good glass positives are usually sent out unvarnished, backed with black velvet, a gilt mat and a piece of glass laid on them, and the whole bound together with a metal binding, technically called a "preserver." They are also frequently met with, especially in second-class work, varnished on the film side with white spirit varnish, and on the reverse with Bates' or some other black varnish, in lieu of black velvet. The metal mat will often be found to have damaged the film where its edges have come into contact with it; in such cases it is *generally* best to limit the amount of subject of the copy to the space exposed by the opening of the mat.



How to Copy Glass Positives. A, Bath Cork; B, Glass Positives kept in place by Four Pins; C, Camera with Shutter of Dark Slide drawn out; D, Stand; E, Black Cloth hung in Front to prevent Reflected Light; F, Table on which the Bath Cork is placed, supported with a strut at back, or heavy books may be utilised for this purpose.

In the case of a good unvarnished picture, our first care is to remove it from its case, mat, and preserver, carefully removing any dust and dirt with a soft camel's-hair brush. Little else can be done or be found necessary to do to it previous to copying. If it happens that the varnish on the face is dirty, a moist rag may be used to remove the dirt; if black varnish has been applied to the back, and has become scratched, the best plan is to scrape it all off with a knife and re-black it, as patching up is apt to show on the face; but if applied on the film side, we must let it remain as it is, for any attempt to remove the black would inevitably spoil the picture. Turpentine or benzole would dissolve the asphaltum, but at the risk of staining lights of the image—probably somewhat yellow, from the varnish that has already been applied. When we examine a glass positive by *transmitted* light, as we do negatives, it has the appearance of a very under-exposed negative, little more than the high lights being visible. It is, in fact, an exceedingly *thin negative*, but with this difference: in an under-exposed one the details in the shadows are not absent, although almost invisible, by reason of their extreme tenuity. *Reflected* light, on the contrary, shows up every detail even in the darkest parts, and in the early days of photography beautifully made out detail was taken advantage of to convert a positive into a negative in order to multiply proofs. In ordinary collodion negative work, the image before drying frequently shows as a good positive on the back, although, after being dried, it loses its positive appearance, not again to be restored by remoistening, and becomes invisible, or nearly so, by reflected light. It is necessary to caution those who have only had experience with the tough leathery gelatine films that all collodion surfaces are *most easily* injured, and no greater friction than that of a soft brush, delicately applied, is permissible; unless, as before said, they have been varnished.

In the majority of cases very light plain backgrounds have been used, and it is almost impossible to touch out defects on them in the ordinary way that will not show objectionably in the copy. An excellent plan is to paint all over the defective background with a suitable tint of grey opaque water-colour. An excellent one is composed of Chinese or zinc white and lamp-black, a little hatching with a deeper colour grey near the lower part of the figure being often an advantage.

Covering the background with opaque colour is very useful if the positive has been broken in pieces, as it perfectly hides the junction of the fractures, even if the film is broken away; of course, the damaged picture must have been previously cemented to another piece of glass—with Canada balsam by preference—and allowed to harden; the edges of the broken parts having been accurately adjusted to each other. When positives are mounted face outwards to the case, the portrait will be reversed; in the same manner, a face is seen in a mirror which, although conveying a better impression to the individual represented, does not do so to others. Some concession must be made to this method of mounting by reproducing the copy in the same position, looking to the right or left, as the case may be. This is important if the original of the portrait is dead, as the friends are so used to the appearance of the reversed picture that they would probably disapprove of any alteration. Therefore, when a picture is removed from its case it must be remembered in which position it was mounted in order to restore its original appearance.

Having done all we can to remedy defects, we proceed to make our copy by fixing the positive to an upright board—of a dark colour by preference—by means of four pins, one at each corner (a slab of Bath cork is one of the most useful appliances in existence to use in place of board for this and similar purposes), in a convenient position for copying. Glass being prone to cause ugly reflections, care must be taken that no light falls on it—that is, reflected into the lens—than that required to form the image. If the film side has to be copied, there is less chance of defects from this cause than with the bright surface of the glass; at any rate, front light is best wholly excluded by hanging up dark cloths in such a position that front light is cut off, and the illumination of the picture limited to light from the sides and top. The camera is now to be adjusted so that the positive is exactly *central* with the lens; any deviation from this will cause more or less distortion. As soon as the image shows squarely and of the right dimensions on the focussing screen, it will be correct in this respect, and all that remains is the focussing, which can be best effected by the aid of a magnifier, so that the image is seen absolutely sharp, a small stop being always used for the exposure, even if the focussing is done with a larger opening for the sake of more easily seeing the image. All being ready, a plate is inserted and the exposure made. With regard to the length of exposure, it is impossible to say anything definite, as it depends on the amount and colour of the light at the time, and the lens used. Slow or, at any rate, not very rapid plates are best for the purpose; those containing iodide, known by the yellowness of the film when examined by daylight, are to be preferred. Some operators prefer wet collodion plates for this work, but I believe their advantage is simply owing to the iodide and the comparative slowness with which they work when compared with the very rapid gelatine plates so often used, and that I have always found unsuitable for this kind of photography. "Ilford ordinary" plates give very good results, as also do Wratten's, London. Now comes the development. By preference, I use the pyro-ammonia, according to the formula issued by the Ilford Company, as subjoined:—

Pyrogallic acid, 2 grains; bromide of ammonium, 2½ grains; liquor ammonia, ·880°, 4½ minims; water, 1 ounce.

As a matter of convenience, it is best to keep 10 per cent. solutions made up, and use a proportionate quantity of each. The ammonia should be added gradually, as sometimes less than the normal quantity will be found sufficient, too large a proportion producing a flat image. The most usual defect in the copy of a positive is flatness, which may be the fault of the positive itself, or may be caused by improper development. The shadows in a copy should be clear and the lights not too dense,

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but rather more so than in a portrait negative. A very little re-touching will be necessary, but a slight strengthening of the high lights may be an improvement. The printing of the negative differs in no way from that ordinarily adopted. To enlarge the positive, the process is precisely the same as far as precautions go; the difference is the distance between the lens and the picture and the lens and the plate, the first being less and the latter more than in reproducing the same size. The negative also should be a trifle thinner in the enlargement than in the same size copy, but in reductions the density of the negative is maintained. The diagram shows the arrangement for copying.

CARTON-PIERRE OR STONE PAPER.

BY GEORGE PARLAND.

CARTON-PIERRE or paper stone is used for a great variety of decorative purpose—gallery fronts, sunlights, etc.—where strength and toughness are required. Thousands of hobbyists will be glad to learn how it is made.

Fill an ordinary washing boiler or copper half full of clean water, and into it put as much paper cuttings or scraps of old newspaper torn up as can be pressed under the water; then set the water boiling, and add two pounds of the best joiners' glue; keep it now well stirred up, and the paper will become a pulp and the glue dissolve.

Have ready two pounds of the best flour made into a paste with a quart of water; also, in a separate vessel, pour a quart of water, and sprinkle into it a handful of fine plaster-of-Paris. Let it stand ten minutes before mixing it.

When the paper in the copper has become a fine pulp (which can be seen by lifting some out on the end of a stick) add the flour paste, keeping the whole well stirred. Fifteen minutes after add the plaster, and a few minutes later rake out the fire from under the copper. Have ready three pailfuls of fine ground whiting; pour in one pail of whiting, and stir up well, adding more whiting till the stick used to stir it will stand of itself in the mixture. Let it cool, and it is ready for use.

Some firms add powdered alum in the boiling process, others add one pint of boiled linseed oil; but if made according to the above directions an excellent carton-pierre will be secured, and one that will give very fine impressions from the moulds.

If the mould from which a cast is wanted be a plaster piece, the pieces of the mould must be well dried, and have two or three coats of shellac varnish till the varnish shines out on the surface when dry. The mould must be oiled with sweet oil, and it is ready for the carton.

If it be a gelatine mould, oil the same with sweet oil, and slit with a sharp knife those portions that are deeply undercut. If the mould be in the form of a pinnacle or circular pendant undercut, slit one side only from top to bottom, and the casts will easily be got out.

In using the carton, sprinkle some fine plaster-of-Paris on a bench, and, taking a lump of the newly-made carton, mix it well with dry plaster, adding more plaster as bakers would add flour to their dough. Having worked it up well in this way until it will not stick to the fingers, with clean hands roll pieces very smooth in the palms or on a smooth level board, and press each roll into the cavities and hollows of the mould, often wetting the edges of the carton in the mould before adding a fresh piece to it. The casts must not be more than from $\frac{1}{8}$ in. to $\frac{1}{4}$ in. in thickness, except at the outside edges of the mould.

Large casts with perforations and casts with delicate points are strengthened with wire embedded in the carton. The places where the screw-holes are to be are protected by having wire twisted once or twice round a sprig-bit—just sufficient to allow the screw to pass through, but not the head.

If the mould has a flat top, fill the mould level with sawdust, well pressed down; place a board on the top, turn over the mould board as well, and remove the mould.

Should the top of the mould be concave or convex, a plaster case must be made, by first putting a thick layer of sawdust over the cast and covering it with paper, then a coating of plaster-of-Paris, making it strong enough to support the cast when the mould is removed.

The casts must stand about twenty-four hours, and then be baked in not more than 100 degrees of heat. They are then trimmed, sand-papered, and any crack or disfigurement made good with a little putty made of whiting and glue size. The whole is then finished by painting with two coats of clear whiting and size. In fixing them up they are screwed to the joists or woodwork, and puttied up.

Detached portions of carton can be quickly and firmly cemented together by notching the parts to be joined and coating them with hot glue. Put a layer of gilders' compo between, and squeeze the parts firmly together. Remove the superfluous compo, and brush it clean with hot water.

WORKERS' QUESTIONS: TRADES UNIONISM AND WAGES.

BY ECONOMICUS.

IT is a vexed question whether trades unionism is or is not efficacious in raising workmen's wages. The more sober-minded amongst us consider that it is not, and that the sole extent to which it operates upon wages is to stave off for a while an inevitable fall of wages, and to secure more quickly a rise when wages are rising otherwise. Those that hold this view reason thus: When wages are falling an employer of union men hesitates to reduce his men's wages. There is the danger of a strike, as the reduction will affect all his men simultaneously, and so he puts off the unpleasant duty as long as he can, in the hope that perhaps the rate of wages may rally, and, at any rate, until the decline has become a well-established fact by others having put it into force. It is different when he can treat with his men as so many units when they are still in the non-union stage. He can give notice to one to-day, to another to-morrow, and so on, of his intentions as regards them alone. If these individual workmen do not like it, and prefer to lay down their tools, he is little, if any, incommoded.

It is thus very clear that unionism tends to keep up wages in a falling market. The converse of this is equally clear—viz., that unionists will secure the rise in wages sooner in a rising market. A workman may know that wages in his particular industry are rising, and he may make representations to this effect to his employer. The employer, however, dealing with only one man, can easily, if he be so minded, put him off. It is different again, however, when the representations come from a whole body of workmen. The employer is likely to hesitate again ere he puts them off. Thus, besides staving off the fall in wages in a falling market, unionism also secures a speedier rise in a rising market.

Does it do any more? Does it actually raise wages? There are those that hold that it does. There are no clear and satisfactory explanations given as to the way in which it does this. Those that believe in this view have, to all appearance, a good case to cite as an example. That case is the Bar, the members of which are formed into a very close union, and one of the most rigid rules of the union is that no barrister shall accept a smaller fee than one guinea. But for this rule, barristers will tell you that their fees would fall almost to nothing. There are so many members of this profession without briefs, who never have had a brief, and who never will have a brief, that they would accept employment on almost any terms. If the barrier prohibiting them from pleading for any fee they can get were withdrawn, there can be no doubt that the average fee for professional representation in a court of law would be nearer 5s. or 2s. 6d. than 21s. Here, then, we are told, is a clear case of unionism keeping up wages in the face of competition; and if unionism acts this way in one sphere of employment, why not in others?

In the first place, we question whether this rule of the barristers' union keeps fees up to the extent it is credited. No barrister was ever *known* to accept a smaller fee than 21s. But then, "there are more things," etc. A young Scotsman, now a thriving barrister and member of Parliament, after graduating at one of his native universities, came up to London, and was, in due course, called to the Bar at the Middle Temple. He used at first to attend the Old Bailey in his gown, so as to familiarise himself with court procedure. On one of these visits a stranger slipped half-a-guinea into his hand, and asked him to appear in some case. He could not accept the half-guinea, he said—a statement that astonished the stranger, who explained, "I know you took half-a-guinea from X, for he told me so!" It then transpired that the stranger had mistaken the young Scot for some other barrister, well enough known to-day, and whose services would be hard to get at a guinea now.

This story, which we have direct from the lips of one of the parties, shows that though barristers are not *known* to plead for less than a guinea, they nevertheless do so. Thus this very close union and this very rigid rule are not able to withstand the pressure of competition. It would, however, be obliterated altogether, but for one fact: that fact is that the unemployed barristers get food and other necessaries without briefs. In many cases they have private means, and can afford to wait until the guinea comes, and in other cases they flow over into other callings. They become journalists, coaches, something in the City, or whatever else they are able to become. If it were essential for the unemployed amongst barristers to get briefs ere they could get food, then the rule prescribing the *minimum* fee at a guinea would be as operative as Canute's command to the waves to retire. Moreover, they would not take low fees on the quiet, as illustrated by the foregoing story; on the contrary, each would underbid the other, and the one that offered the best bargain would get the most patronage.

It comes clearly to this, then—that though unionism delays a fall of wages, forces them up to their highest possible point, and accelerates a rise, there is yet some other force that determines them—a force that both employers and employed are subject to. This should be apparent to everyone; for if unions could fix wages, why do they not make demands for something substantial when they are about it? Why do they not pass resolutions that the lowest union rate of wages shall be £300 a year? No one would object to this or any larger sum being the lowest income in the country. Everyone, on the contrary, would rejoice that the reward of toil was sufficient to enable the toilers to live in comfort, and to make provision for their declining years.

As to the cause that really does fix wages, that has been often enough pointed out, though it seems to have little hold on the minds of those that write about strikes and offer advice to workmen. It must be easy enough for anyone to understand that if half a dozen men are after the same job, that a similar job will be done at a much lower wage than if half a dozen masters were each after one man to do it. When an employer has a great many men to pick and choose from, he naturally takes the one that he can get the most out of—that is, the one that will do the most work for the least wages. When, on the other hand, a workman has several masters after him, he naturally accepts the one that will give him the most wages. If, then, the demand for employment be keen—that is, if there are a great many men eagerly seeking work—wages will fall, in spite of union rules; and if the demand for workmen be keen, if employers are competing with one another to get men to work for them, then wages will rise. This is how wages are determined; we say nothing upon the point as to whether this is the best way to have them determined.

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PATENTS REVENUES.—It seems impossible that any enlightened community would descend to the extent to put money into the national pocket at the cost of the brains of its best life. Yet this is what England does through one of its most profitable departments—that dealing with Patents, Designs, and Trade Marks. Why struggling genius should be hampered in this way we fail to see. It would be far more creditable to the State if, instead of boasting a surplus of £122,000 on its Patent revenues of £203,000, it were to cut down tens of thousands of its useless and ornamental expenditure and hold out premiums to the genius of its sons, giving them free and easier processes to test their inventions, and clearing the road of impedimenta in the shape of interested officials when an invention—should it be a Government matter—is perfected and ripe for adoption. Where would the greatness of England be but for its industrial inventions? And we tax this knowledge!

ARTS AND CRAFTS EDUCATION.—The recent Annual Exhibition of the Home Arts and Industries Association has fully justified the Society's Report for 1892, which shows that the useful work of the association is still carried on with the old enthusiasm. In many places the County Councils have used the funds at their disposal for technical education in helping on the work of the association, and the wisdom of this step is amply proved when the results are compared between aiding classes already started and in the hands of experienced teachers, and giving the money to start fresh teaching under the superintendence of inexperienced persons. Wood-carving, metal-working, embroidery, hand-spun wool and linen, hand-woven fabrics, bent iron work, embossed leather, carpentry, baskets, and specimens from more branches of industrial art, were shown, and everyone interested in such work, either from the artistic or philanthropic point of view, must rejoice at the work shown, which, with the exception of a very few pieces, was the labour of people—chiefly lads and girls—of the working class.

TECHNICAL EDUCATION.—Amongst the many projects in vogue at the present day for increasing practical knowledge and rendering the rising generation of more utility to themselves, and also to the State, that of technical education is by no means of the least value, but unless it be confined to its legitimate use and position, is more likely to raise up a generation of "smatterers," "amateurs," and "dabblers" than produce properly skilled and capable mechanics. As a preparatory system for enabling youths of twelve to fourteen to become acquainted with the principles of a given industry, and acquire a certain amount of preliminary knowledge of the tools, apparatus, and processes employed in the industry he is destined or desires to follow, there can be no doubt of its benefits and utility; but the great and serious danger is, lest what is really the initial step for aiding a youth to practically become acquainted with the preliminaries of a given industry before he enters into the business of acquiring the proper practical knowledge of it, be taken as equivalent to a thorough practical training in that business. We allude here especially to what are called "schools of engineering," in most of which the pupils are "amused" with making models—say from 10 to 5 daily—and learning in a "gentlemanly" way—as they think—to become practical engineers. A more erroneous and injurious notion can hardly be conceived, and it is quite time that people should be put on their guard respecting it, so as to prevent disappointment and discredit being thrown upon what does not deserve it. There is no royal road by means of which a boy may be made into a skilled and capable mechanic or engineer. The ability, experience, and skill required for this purpose can only be obtained by apprenticeship in a works or factory where *reality* is dealt with, such as repairs, breaks-down, conversions, etc., as well as new work—conditions that never come in the way of technical schools. For a boy to become an engineer or mechanic, and be qualified as a master man, requires a five to seven years' apprenticeship in actual works—the more varied their work the better—in order that he may become practically acquainted with the varied conditions of the business, and gain that experience which is not, and cannot be, furnished by technical schools. Such institutions, though admirable for preparatory purposes, cannot by any means be treated as substitutes for a regular apprenticeship to any business. Parents will do well to keep these facts in mind, and not waste time or money in imagining that sending a youth to such places qualifies him to come out in the world as a skilled mechanic, with the needed knowledge and experience required to enable him to take, or even hold, his position in the battle of life, with any chance of success. Such a course is most prejudicial to the interests of the youth who may be so treated, and is quite enough to damp his energies and aspirations, and probably have an unfavourable influence on his future life. A proper consideration and understanding of what we have said may, it is to be hoped, lead parents and guardians to look before they leap in this matter of finding employment for boys.

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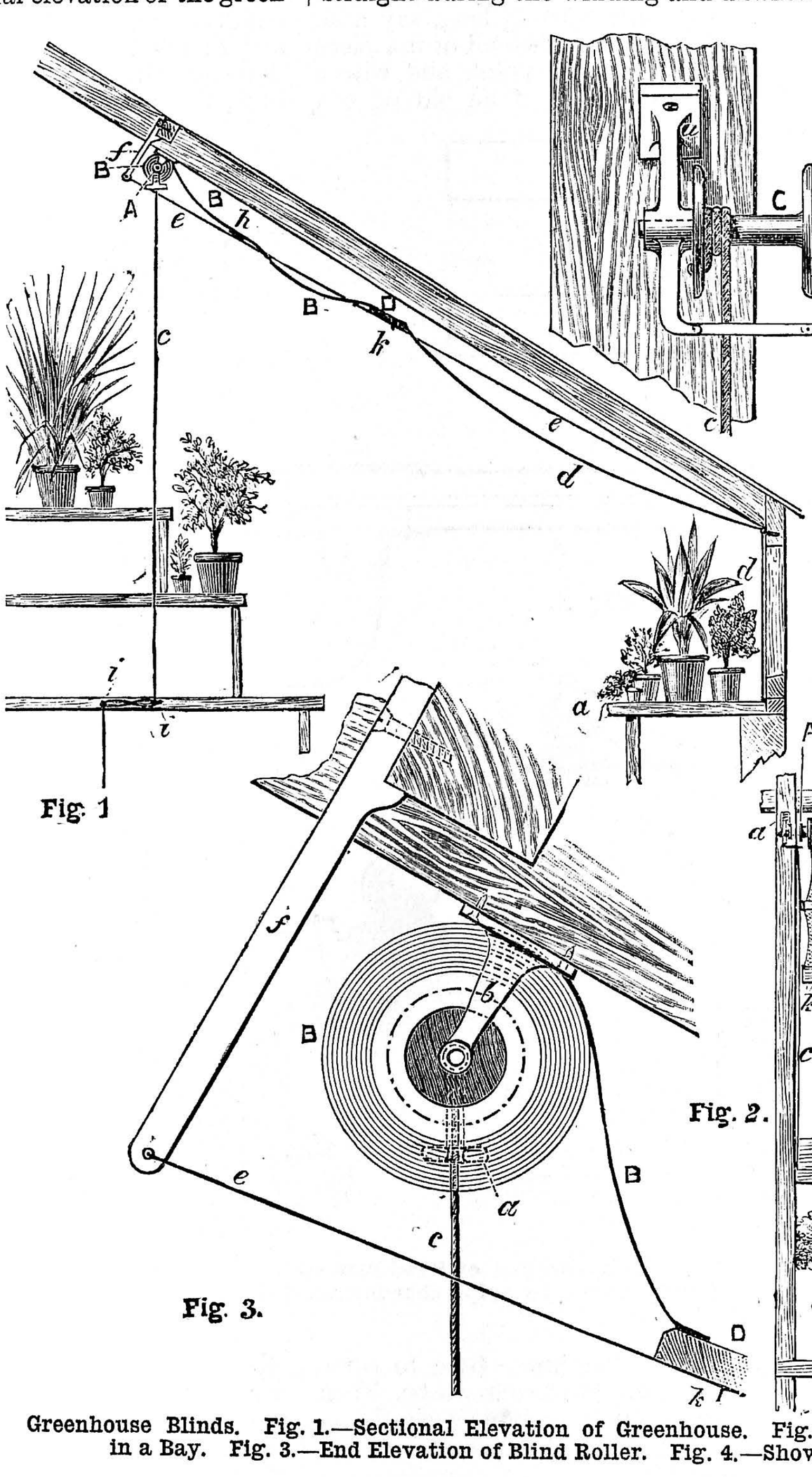
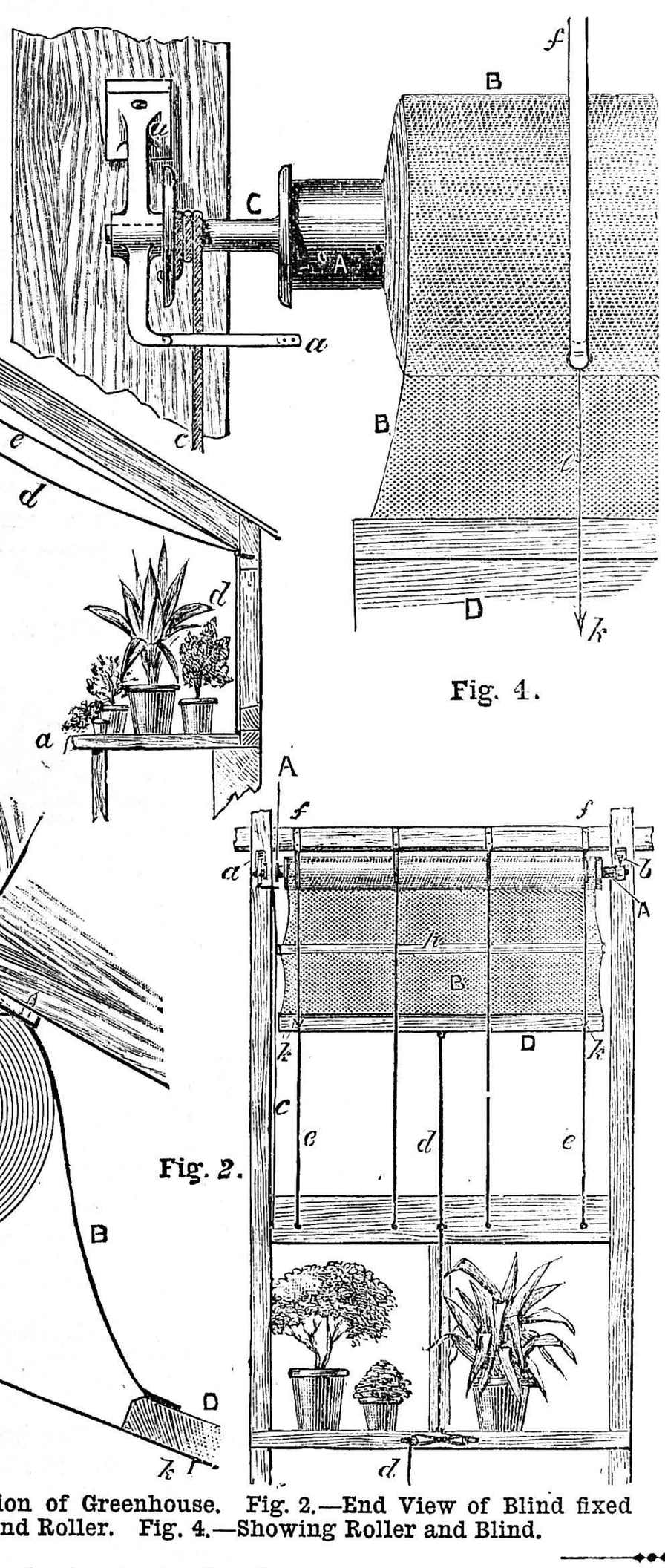
GREENHOUSE BLINDS.

BY P. B. H.

READERS of WORK belong to all classes, and I have no doubt a quantity of them employ their spare time in gardening and the cultivation of flowers. The following simple arrangement of greenhouse blinds will prove useful to such. The blinds were inclined as shown on the drawings.

Fig. 1 is a sectional elevation of the greenhouse, showing a blind for one bay; Fig. 2 is an end view of blind fixed in a bay. These two figures are drawn to the scale of $\frac{1}{2}$ in. to a foot, thus making the blinds about $3\frac{1}{2}$ yds. long by 54 in. wide. Figs. 3 and 4 are views of one end of roller, showing the pulley and cord by which the blinds are wound up. A is a light wooden roller about $1\frac{1}{2}$ in. diameter, and slightly longer than the width of the blind, B, which is first nailed accurately across its length. The best way of accomplishing this satisfactorily is by following one of the cross threads during the operation of nailing. If you do this the blind will roll up straight. C is a metal pulley round which the cord, *c*, is wound when the blind is drawn down by the cord, *d*. The two ends of the blind roller are carried by the two fixings (*a* and *b*) screwed to the underside of the beam, the former having a slotted arrangement cast to it, through which the winding cord, *c*, passes to prevent it running off the pulley, C, when being wound on. At the extreme end of the blind a piece of wood, D, $\frac{1}{2}$ in. by $1\frac{1}{2}$ in., is nailed, the material being slightly stretched during the nailing; this should also be done on the roller.





Greenhouse Blinds. Fig. 1.—Sectional Elevation of Greenhouse. Fig. 2.—End View of Blind fixed in a Bay. Fig. 3.—End Elevation of Blind Roller. Fig. 4.—Showing Roller and Blind.

Now, a blind of such coarse material as greenhouse netting, and $3\frac{1}{2}$ yds. long by 54 in. wide, will need some support; so just below the roller, A, making allowance for clearing when the blind is rolled up, stretch four thin wires, *e*, held at top end by small metal fixings, *f*, attached to cross beam, and at the lower end by eyes, *g*, screwed into woodwork. These wires should be tightly drawn, and spaced as shown plainly in Fig. 2.

These wires alone, however, will not prevent the blind falling through, so in a blind of the above length it will be needful to have four cross-pieces, *h*, spaced equi-distant between D and roller A. These cross-pieces should be of light wood, $\frac{3}{16}$ in. thick by $\frac{3}{4}$ in. wide, and slightly longer than the width of the blind; they should be tied in four places to the underside of the blind; this latter, while tying the string, should be slightly stretched. These laths, *h*, form a good support for the blind, and keep it well stretched. In order that the blind may run straight during the winding and unwinding, two small U-shaped pieces of wire, *k*, are driven into bottom cross-piece, D, encircling the wire.

The cord used both for winding and lowering is the ordinary window cord. In the winding the cord is passed through a hole in the flange of the pulley, and a knot tied thereon, and when the blind is fully wound up two or three turns of the cord should remain wound on the pulley. It should be long enough to fix the blind in any position by wrapping it round the hooks. The cord for drawing the blind down is tied to an eye screwed into cross-piece D, then passed through two eyes in the front frame of the greenhouse, and brought to the front of flower stand, where it can be fastened by means of hooks, as shown plainly in Fig. 2. Suppose the blind be drawn to its extreme height (Figs. 3 and 4), the cord, *c*, as already mentioned, must still encircle the pulley, C, about three times. To lower the blind, the cord, *d*, must be drawn down when the blind unwinds, at the same time winding the cord, *c*, on pulley, C, ready for the rewinding, which is accomplished by pulling the cord, *c*. The blind can be held in any position by fastening *c* below, and then drawing *d* tight, and fastening it also.

VARNISH.

SELECT the palest lumps of copal gum, and crush them into small pieces; tie in a bag of fine muslin, and suspend in a bottle of sulphuric ether, when the copal gum will gradually ooze out into the ether. When the gum has been digested, let the bag drain off and be thrown into another bottle of the ether, which will remove all the available gum. It is a good plan to have plenty of the gum, so that the liquid will form a varnish sufficiently thick. Then add oil of caraway, or any slow-drying essential oil, as oil of anise, poppy, or sweet almonds, which are as colourless as possible in such small quantities; this will make the varnish dry more slowly, and render it more elastic. If it dries too thickly, add oil of rosemary, or some colourless essential oil, that it may dry as fast as may be required. Should it dry too slowly, add more ether and mix thoroughly.

MAGNETISING.

IT is found that by heating magnets in an atmosphere of steam they will lose from thirty to sixty per cent. of their strength; but if re-magnetised they will stand exposure to steam with very little loss of magnetism; and, in addition to this, the magnetised bars will also withstand the deteriorating effects of mechanical vibration. A magnet was boiled for four hours, then having been re-magnetised and placed in steam for two hours, it was found to have lost only $\frac{1}{900}$ of its magnetic moment, and after being hammered for some time with a wooden bar it only lost $\frac{1}{400}$ of its strength.

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HOW TO PREPARE CHEAP BLOWPIPES.

BY H. B. STOCKS.

"MOUTH" AND "FOOT" BLOWPIPES—BLOWPIPE TO HOLD IN THE HAND—BLOWPIPE ON STAND—MATERIALS REQUIRED FOR BLOWPIPE TO HOLD IN THE HAND—METHOD OF MAKING—ADJUSTMENT OF AIR SUPPLY FOR LARGE OR SMALL FLAME—BLOWPIPE ON STAND: MATERIALS REQUIRED—METHOD OF MAKING—PROBABLE COST OF BLOWPIPES.

I WISH to give a few practical details on the construction of blowpipes. Readers may look up pp. 92, 354, 831, Vol. II., and p. 356, Vol. III., etc., where they will find figures of blowpipes by various makers, showing the uses to which they are applied. Most of these blowpipes are exceedingly good. We do not wish to compete with them; our humble task is to describe how one may make a blowpipe for himself to suit his own individual requirements. I do not wish anyone to adhere exactly to my measurements, someone may require a larger or they may require a smaller blowpipe than mine: if so, increase or diminish the sizes.

For our purpose we may divide blowpipes into two kinds: "mouth" and "foot" blowpipes; also into two classes: (1) To hold in the hand; (2) on stand. The simplest form of blowpipe to hold in the hand is the mouth blowpipe; this requires no description, as its construction is apparent to everyone. Fig. 1 shows a blowpipe to hold in the hand applicable to autogenous soldering, etc. The materials required to make this blowpipe are a three-way tube; a piece of $\frac{3}{8}$ in. brass tube 4 in. long, with thread cut at one end; one piece of $\frac{3}{8}$ in. tube $5\frac{1}{2}$ in. long, and curved, with thread on one end; one piece of $\frac{3}{8}$ in. tube $3\frac{1}{2}$ in. long, also with one thread; one piece of brass tube $5\frac{1}{2}$ in. long, about $\frac{1}{8}$ in. diameter; a small piece of thin sheet brass.

The construction of the blowpipe will be seen at Fig. 2, where A is the outer tube, B the air supply, and C the gas supply.

Commence by cutting out a piece of sheet brass full $\frac{3}{4}$ in., and $\frac{1}{2}$ in. wide; turn it up into the form of a ring; solder this on one end of the $\frac{1}{8}$ in. tube, file the brass strip down until it will push into the tube which is $3\frac{1}{2}$ in. long, solder it inside of the thread end, screw this into one end of the three-way tube, screw on the outer tube, and see that the $\frac{1}{8}$ in. tube is exactly in the centre of it; then into the side tube screw the 5 in. curved tube (see Fig. 1), and the blowpipe is complete.

The inner tube of the blowpipe should come within one-eighth of an inch of the end of the outer tube. If during blowing there is a white patch in the flame, either the inner tube is not directly in the centre of the outer one or the inner tube is too long; in that case, file it down a little until correct.

If a fine-pointed flame only is required, do not cut the inner tube so long, say 2 in. shorter, and solder into the end of it a piece of tube tapering to a fine point, and with a very fine hole (the tube of an old oil can

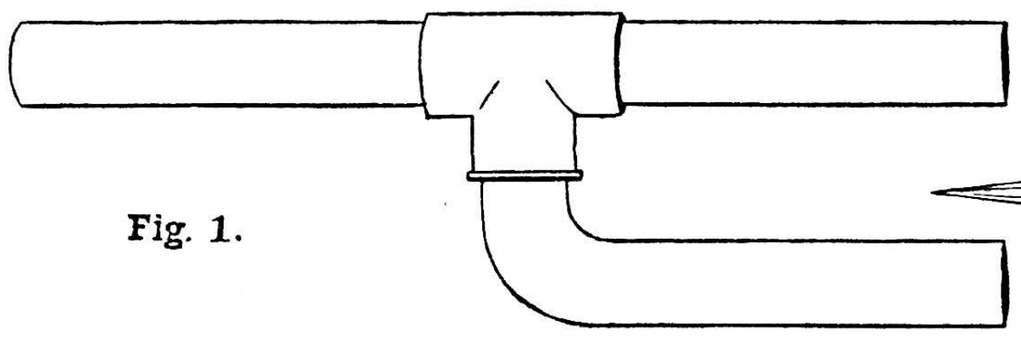

Fig. 1.

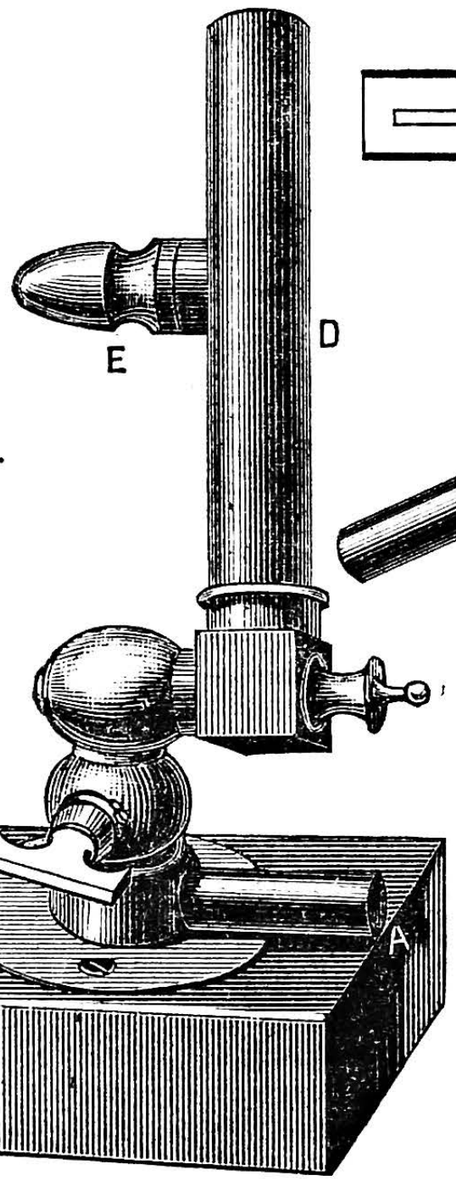

Fig. 4.

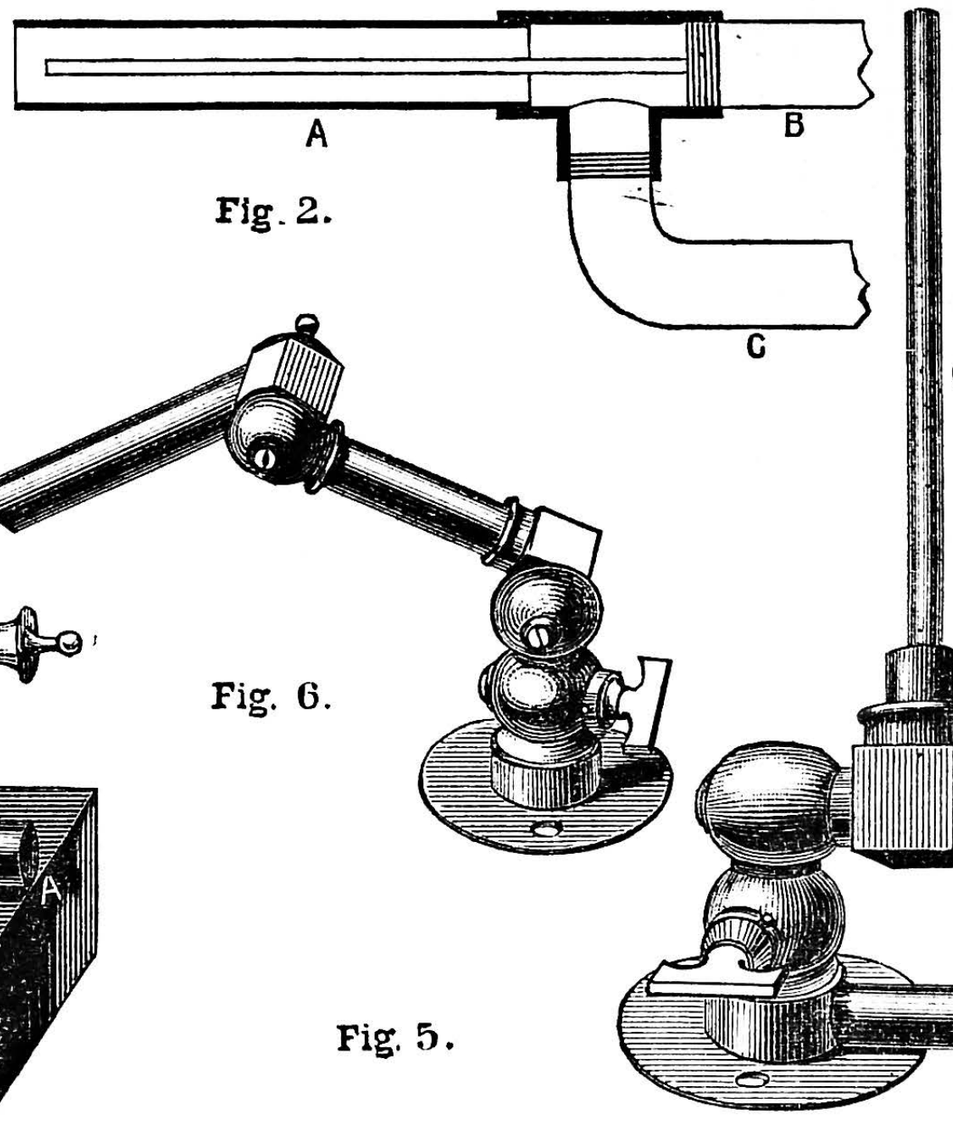

Fig. 2.

Fig. 6.

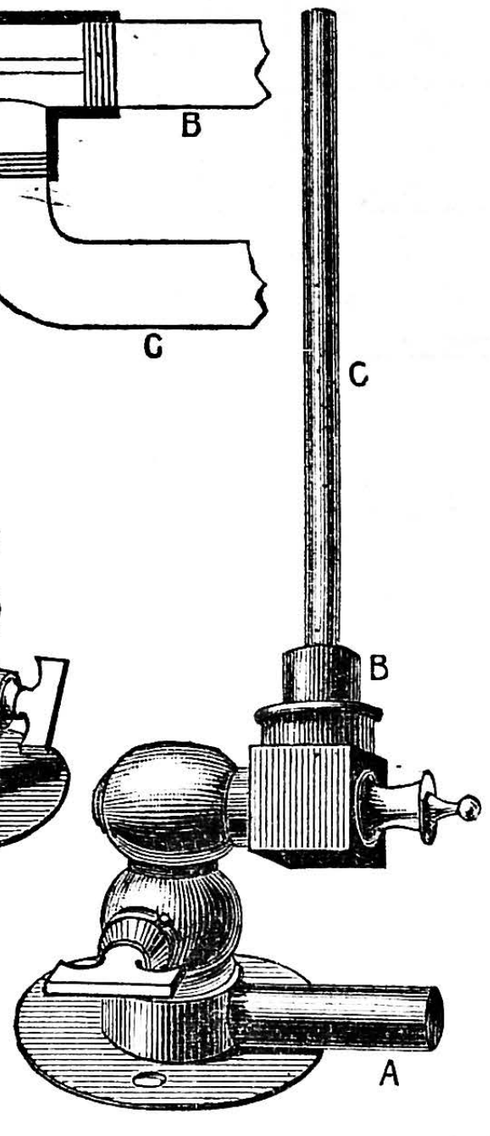

Fig. 5.

Fig 3

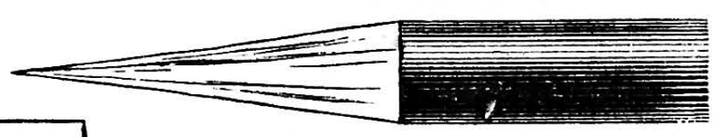

Fig. 3.

Cheap Blowpipe. Fig. 1.—Hand Blowpipe. Fig. 2.—Section of Hand Blowpipe. Fig. 3.—Small-pointed Flame. Fig. 4.—Stand Blowpipe. Fig. 5.—Stand Blowpipe showing inner Tube for Air. Fig. 6.—Blowpipe with Double Joint.

right angles to the cock; tap it for a $\frac{3}{8}$ in. tube, cut a circle of brass $\frac{1}{2}$ in. in diameter, and solder it over the hole at back of boss, as we wish to close the gas supply there, but let it in by the side tube, E. Screw in the bit of tube $\frac{3}{4}$ in. long at B (Fig. 5), cut out a piece of sheet brass $1\frac{3}{8}$ in. long, $\frac{1}{2}$ in. wide, coil it up in the form of the ring, and solder it over B; at the same time solder inside the $\frac{1}{4}$ in. tube, C, and file down the portion B until tube D will slip on with a push.

Now take tube D in the side, and at the middle of the tube bore a hole $\frac{3}{8}$ in. in diameter; file the nozzle, E, to a rounded-out shape at end, so as to fit close against the tube, D. Screw in the bit of $\frac{1}{2}$ in. tube, and file it out in the same way until about one-sixteenth of an inch is showing; knock it into the hole in tube D, and solder. Push the tube on to B, and see that the inner tube comes within about $\frac{3}{8}$ in. of the outer tube. In the wooden block bore out sufficient to allow of the brass circle entering the wood, and thus leaving the boss flush, then screw to the block; also screw in the side tube.

The gas is let in at E; there will always be a tap on the gas supply to regulate it by, and the air is regulated by the tap on the blowpipe. But if the gas supply is some distance off, and you require alternating heats, then put a tap on E. If a fine flame is required, proceed as in the hand blowpipe.

With this blowpipe we get one movement vertical of the elbow-piece; but if another tube and elbow-piece are inserted between the burner and the stand, a double vertical motion will be got, which will be very useful. This will higher the blowpipe, and allow also to blow down upon anything which it is required to heat. (See Fig. 6.)

I am sure the cost of these blowpipes must be comparatively small. Most people have odd pieces of tube lying about, as I had, which will come in handy; the others may be got of a plumber or second-hand. I gave 3d., second-hand, for the brass boss, and $2\frac{1}{2}$d. per ft. for the $\frac{1}{4}$ in. tube. The total cost of the hand blowpipe will be about 1s., and of the one on stand, 2s.

I have said nothing about blowing arrangements, preferring to leave them till some future time. In the meantime, look up back numbers of WORK for articles upon bellows and fans, where you, or indeed any student interested in chemical matters, will get many ideas.

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AIDS IN AILMENTS.

EXTERNAL APPLICATION.—Alcohol for external application for strained muscles was a remedy sometimes adopted by the celebrated bone-setter, Hutton. A linen bandage was bound round the injured part, after it had been soaked in brandy or whisky, loose enough to allow movement, if such were permitted; if in a sling bandage, to prevent movement—never tight enough to stop circulation. Relief from pain was mostly quick and lasting. For sore throats, flannel dipped in brandy and bound two or three times round the throat, and the bandage covered with oil-silk or waterproof cloth, acts rapidly on the nerves and tissues of the throat, so that relief is soon felt. Two or three applications of a soaked bandage, aided by slightly aperient medicine, effect a cure and prevent more serious complications of the delicate structure of the throat.

SORE THROAT—WOUNDS.—An elixir known to be an excellent preventive of sore throats and colds, to be gargled and swallowed:—2 oz. of camphor; ¾ oz. of spirits of mindererus; ¼ oz. of ipecacuanha wine; 1 oz. of any simple syrup. A teaspoonful occasionally. For wounds and ulcers, pour two pints of boiling water over two drachms of dried hemlock; add crushed linseed (not linseed meal) to make into a poultice. Its efficacy has been extolled. For sloughing wounds, a little powdered alum added is good.

EMBROCATION.—Of the many embrocations now offered to the world, the one which is pre-eminent for efficacy for strains, rheumatism, enlarged joints, and muscular injuries generally is now given to the readers of WORK by a gentleman whose long experience as a veterinary surgeon and stock-keeper gave him extensive opportunities of testing its sterling worth for man and animals (with animals it may be saturated on a bandage and applied). Mix 2 quarts of white wine vinegar; 1 pint of spirits of wine; ½ pint of turpentine; 3 drachms of camphor; 4 yolks of fresh eggs. The spirits of wine mixed previously with the camphor; lastly, the turpentine. To be well rubbed into part affected (always rubbing upwards), and cover up parts with soft flannel.

TIPS.

WHEN young draughtsmen experience the difficulty of getting colour to wash properly over the rough side of tracing cloth, the difficulty can be got over by grating a piece of common washing soda, about the size of a pea, to a fine powder, and mixing it with the colour in the palette. The soda kills the grease in the tracing cloth, and therefore the colour can be more rapidly and correctly spread over the surface.

A GOOD lacquer for oven pipes is made by dissolving yellow ozokerite in heavy crude naphtha. It is brushed over the iron and then burnt off, and a polish put on by rubbing it with a greasy woollen cloth. The operation may require to be repeated to obtain a perfect coating.

AVOID the risk of blinding or severely burning yourself when pouring melted lead, in the various uses to which it is put, by placing a small piece of resin in the ladle. This will effectually prevent the metal "sluttering."

SCIENCE TO DATE.

Ozonine.—This is a new bleaching material. It is said to be prepared as follows: 125 parts of resin are dissolved in 200 parts of oil of terebenthine; a solution of from 22 to 25 parts of caustic potash in 40 parts of water is added, together with 90 parts of peroxide of hydrogen. The jelly obtained, exposed to the light, changes in two or three days to a clear fluid, to which the name of ozonine is given. In the proportion of 15 grains to a pint and a half of water it bleaches fibres, wood, straw, paper, etc., energetically, and equally well in acid or alkaline solutions.

Mammoth in London.—During recent excavations in St. Pancras, in connection with the deepening of the main sewer, the remains of a mammoth and other prehistoric animals were found at a depth of about 22 ft. from the surface. Two mammoth tusks were discovered, and a portion of one, on being brought to the surface, was found to measure nearly 2 ft. in circumference at its thickest part. The length of the tusks would be from 9 ft. to 10 ft. Other bones were found, as well as vegetable remains, chiefly the seeds of marshy plants. Deposits usually classed with the high level gravel and brick earth of the Thames Valley were found overlying the animal remains, and hence they are considered to belong to the glacial period.

Coal in Kent.—Further information has been communicated by Professor Boyd Dawkin as regards the progress of the Dover boring. 762 ft. of coal measures have now been pierced, which include an aggregate thickness of more than 7 ft. of coal in nine separate seams, mostly workable. Seam No. 1, 2 ft. 6 in. in thickness, occurs at a depth of 1,140 ft., and Seam No. 9 (1 ft. 8 in.), at a depth of 1,875 ft. Arrangements for the sinking of a shaft are in progress.

Iron Rust.—It is generally supposed that iron rust consists chiefly of the hydrated sesquioxide of iron. Professor Liversidge, of Sydney University, has had occasion to examine a large number of specimens of rust from different places and formed under different conditions, and finds that in almost every instance the rust contains more or less magnetic oxide. In some cases the rust, although presenting the usual appearance, was, when powdered, practically wholly attracted by the magnet.

Depth of the Mediterranean.—Recent soundings executed by the *Pola*, of the Austrian marine, in the Mediterranean have shown the existence of greater depths than one would have supposed. Fifty sea miles south-west of Cape Matapan, a depth of 14,300 ft. was found. Between Candia and Alexandria another sounding gave 10,700 ft.

Temperature of the Sun.—Several attempts have been made at various times to determine the temperature of the sun, and the results obtained vary very widely—namely, from 1,500° C. to 5,000,000° C. The reason of this great variation in the different estimates lies in the fact that different laws have been assumed to represent the rate of radiation. Recent experiments made by M. le Chatelier on the intensity of the radiations emitted by an incandescent body at temperatures ranging from 680° C. to 1,770° C. have afforded fresh data on which to base a new calculation, and the result has been arrived at that the sun's temperature is about 7,600° C., that of the photosphere being probably a little higher.

Electricity and Vegetation.—Experiments lately made on wheat, maize, tobacco, and beans, show that whilst atmospheric electricity exercises a beneficial action on vegetation, so also electricity in the soil has an analogous influence on germination. The less luxuriant vegetation of plants growing in the neighbourhood of trees is due in great measure to the lowering of temperature. Again, according to experiments in North Italy during recent seismic disturbances, as to the effect of earthquakes on vegetation, it is found that the latter induce a more rapid germination and quicker growth, by bringing into play secondary causes, one of which is the increased production of electricity, others being the increase in the carbonic acid produced and the diffusion of nutritive fluid through the soil.

Occlusion of Hydrogen by Nickel.—When water is electrolysed in a voltameter with nickel wires for electrodes, the negative electrode is found to occlude hydrogen. According to experiments by Bellati and Lussarra, after a current had been passed through the voltameter for 200 hours, the wire had absorbed about 100 volumes of hydrogen. The occluded hydrogen is not given off easily, but rather oxidation takes place on exposure to the air.

NOTES FOR WORKERS.

NATURAL coke has been discovered at the Brelli Pass Mines, in New South Wales. The seam occurs in a coal measure covering 550 acres, and is composed partly of ordinary Australian coal and this coke, the junction of the two being clearly defined. It is a little heavier than the manufactured article, contains less fixed carbon, and a much smaller percentage of ash and sulphur. It burns without smoke, and can be mined cheaper than the cost of manufactured coke.

A REPRODUCTION of the *Santa Maria*, the little vessel of 100 tons in which Columbus made his famous voyage, and from which he landed at San Salvador on October 12th, 1492, will be exhibited at the Chicago Exhibition.

A SATURATED solution of corrosive sublimate in water is a good hardening reagent for animal tissues before cutting sections for the microscope. The object is soaked in it for half an hour or more, washed with water or weak alcohol, and then transferred to 70 per cent. alcohol before staining.

A NEW fire-extinguisher is composed of a mixture of water and liquid carbonic acid gas, which, upon being discharged through pipes at high pressure, causes the rapid expansion of the gas, converting the mixture into a spray more or less frozen.

CELLULOID is now being used in the manufacture of rules, set-squares, angles, and other mathematical and drawing instruments.

MOUNT WASHINGTON is to be capped by the largest electric search light ever made—one that can be easily seen from Portland, Me., and, under favourable conditions, from Boston.

THE effect of passing electric currents through wines is to mellow and preserve the healthy ones and to arrest deterioration in those about to turn sour.

BOOKS.

Technical Education.—"Technical Education in the Counties: What is It? How may It be Carried Out?" By G. J. Mitchell, B.A.Lond., and E. H. Smith, Assoc.R.C.Sci.Lond. (George Philip & Son.)—A revised reprint of a series of articles contributed to *The County Council Times*. It is intended to be a guide to teachers and others who are desirous of utilising to the best advantage the facilities afforded by the Technical Instruction Act for the practical education of the young. No writers could possess better qualifications for the task they have accomplished, and no one who feels an interest in this subject can afford to neglect the perusal of their pages. The requirements of agricultural, mining, manufacturing, art trades, and commercial interests, are discussed in detail, and the education of girls is not forgotten. A very useful appendix closes this most comprehensive little volume of 144 pages.

Bent Iron.—"Bent Iron Work: A Practical Manual of Instruction for Amateurs." By F. J. Erskine. (L. Upcott Gill.)—A little book of 52 pages and 27 illustrations, reprinted from the *Bazaar*. It is, of course, impossible to treat this interesting subject exhaustively in so small a compass, but the elementary part of the work is made sufficiently clear. The methods of making the heavier framings should not, however, have been omitted, and a little more detail, both of illustration and description, would have been advantageous to the amateur.

Watches and Timekeepers.—"A History of Watches and other Timekeepers," by J. F. Kendal. (Crosby Lockwood & Son.) A history of watches by J. F. Kendal should be an interesting volume. This little book of 247 pages gives us some interesting watch and clock lore, nicely illustrated. "Time, and cycles of time," show how time is and has been reckoned in all parts of the world in all ages. Dials, clepsydra, and other curious and mysterious timekeepers are noticed. Some useful information relating to clocks and watches is given. This history is incomplete in omitting even a bare mention of the Waltham, Waterbury, and other American timekeepers.

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TRADE: PRESENT AND FUTURE.

*** *Correspondence from Trade and Industrial Centres, and News from Factories, must reach the Editor not later than Tuesday morning.*

IRON AND STEEL TRADES.—An improved tone is noticeable in the Sheffield district. Crucible steel maintains its price, and competition is not so keen as it has been. Rolling mills and tilt forges are better off for orders, and the demand for bicycle tires, octagons, etc., has again increased. Hammer makers are busy, one firm having taken an order for 50,000. The demand for cutlery steel is limited. The Indian markets are opening well for spring steel and octagon sections. Makers of Bessemer steel material have commenced work again.

SILVER TRADE.—In the silver trade there has been a considerable falling-off, as is usual in June, and trade will probably be dull until next September.

IVORY TRADE.—From Tripoli we hear that last year there were exported from that country 46 tons of ivory, valued at £30,000. Most of this came from the Soudan, and is of a softer and inferior quality than that of Zanzibar and the West Coast; yet it would not seem that there has been any great falling-off, either in quantity or price. It has been noticed and remarked that the London market, which is the great selling-place for ivory, has for a long time been in a bad condition.

CUTLERY TRADE.—The Sheffield spring-knife trade is slack, and competition from Germany is having a bad effect. Workmen are feeling the pinch, and many grinders of pen- and pocket-knife blades are earning barely sufficient to pay for steam power. Competition from Germany is also affecting the razor trade. Manufacturers are attempting to accommodate themselves to the requirements of foreign markets, and one firm has sent 500 gross of handle scales to Sweden, where the cutlery trade is developing. In small scissors, which as yet the American cutlers have not touched, there is a great struggle for the market between the English and German makers, the English article being superior to the German for wear, while the Germans beat us in the finish of the goods. The ivory- and bone-cutting trades are both dull, owing, probably, to the exceptional employment of xylonite for table cutlery.

ENGINEERING TRADE.—Most of the large engineering establishments of the Lancashire district are now in operation, and it is gratifying to be able to report even a slight improvement in the machine tool making branch. Several important orders, chiefly for special tools for abroad, have lately been secured, and one of the largest firms in the locality has obtained a good order for a foreign Government in connection with ordnance work. In the other branches of the trade, however, there is but little new work coming forward, locomotive builders being specially slack just now. The shipbuilding industry of the Mersey district remains in the same depressed condition which has now characterised this branch for many months. In the Barrow district, however, both shipbuilders and engineers continue to report trade as being brisk, and new orders continue to come to hand. Business in the iron market is still exceedingly slow, for it is the general opinion that the present prices cannot be maintained for any length of time, and buyers are holding back from placing orders in the hope of securing better terms than at present offered. Only a moderate business is being done in the steel market, both as regards raw and manufactured material. Steel boiler plates of local make are still quoted at £8 per ton. There is little change to report in the metal market, business being, if anything, quieter than of late.

BUILDING TRADE.—The strike still continues in Birmingham. Steps are being taken to form a co-operative society of builders, floated with 2,000 £1 shares offered to the workmen. This ought to be an initial step in the solution of difficulties between men and masters. At Colne the stonemasons and wallers, after giving the master builders and contractors of the town seven days' notice, have struck for an advance of wages from 8d. to 8½d. per hour. In Rochdale and district the building trades continue in a prosperous state. The Kirkcaldy joiners and their employers have settled their differences. Recently the Edinburgh slaters intimated to the masters that they wanted an increase of ½d. per hour on their wages, the rise to take effect at the beginning of August. The masters' action has been by no means unanimous.

JEWELLERY TRADE.—The London jewellery trade would be in a flourishing condition if the result were only to be judged by the new shops opened; but if what the manufacturers are doing is to be taken into consideration, then the judgment will be reversed, for there is much less work at most firms than there ought to be in the middle of the season.

CYCLE TRADE.—A reaction has set in at Coventry and the neighbourhood, the factories not working so late as formerly, it being considered that there are sufficient machines in stock and in hand to meet this season's demands. The question at issue now is: "What will be the machine of the future?" Pneumatic and cushion tires are in some quarters regarded as a passing fad, the idea being that 1 in. solid tires will carry the sway. Experiments are being made with a view to improve geared machines. Our Glasgow correspondent writes:—There is good business being done, especially in pneumatics, and the dealers are troubled to find room to store solids and cushions returned and given in part payment for pneumatics. Great numbers of these returned machines are resold to cycle hirers at prices ranging from £3 10s. to £7 for cushions. Humbers also find their way to the auction rooms, so that working lads with but little cash can in these rooms buy a machine for a very small sum. The Howe Company are busy; their light pneumatic tire machines are taking well with racing men.

SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given.*

I.—LETTERS FROM CORRESPONDENTS.

Alarm.—D. B. (*Glasgow*) writes:—"Should any reader require an alarm which can be absolutely depended upon, I can recommend the following, which I adopted, as my electric bells often went wrong without any warning, and I repeatedly found customers in my shop when we were all engaged in the back premises. I fixed gas-pipe from the meter to the top of my shop door, at which

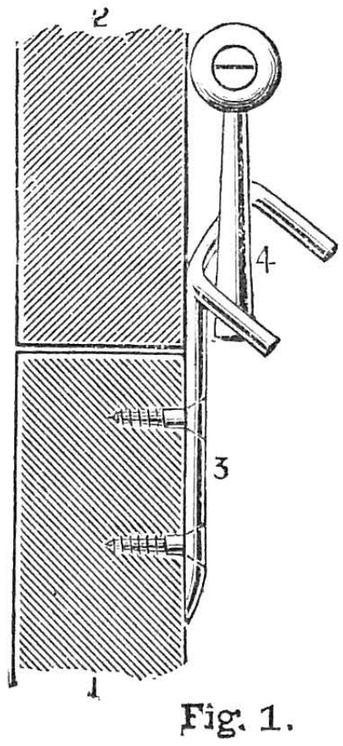

Fig. 1.

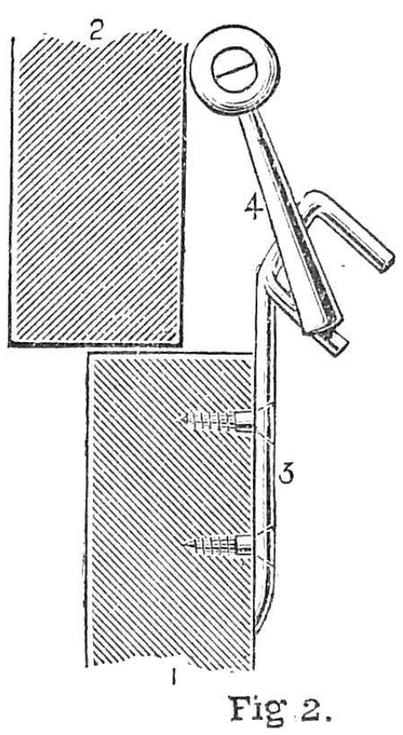

Fig 2.

Reversible Gas Alarm. Fig. 1.—Door closed and Gas full on. Fig. 2.—Door partly open.—1, Section of Door; 2, Section of Woodwork over Door; 3, Brass Wire with Fork to turn Gas on and off; 4, Gas Cock made to work rather stiffly.

point I fitted a cock, which is turned off and on by the opening and shutting of the door. The pipe is then continued to the back premises, and terminates in a branch, which I light, and, at the same time, pull down the blind, or close the shutters to exclude daylight. The cock is so adjusted that when the door is opened the gas is turned down very low, but immediately goes up again on the door being shut."

Evening Class Instructor.—W. A. G. (*Gutter Lane*) writes, expressing his willingness to take "a small class in Carpentry, providing that out-of-pocket expenses are defrayed."—[Our correspondent had better advertise his full name and address in our cheap "Sale and Exchange" column.—ED.]

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Cottage and Garden Wall.—VITA.—If the ground is fairly good and sound, an average depth of 1 ft. would be sufficient, calculating it thus: The wall, one brick, or 9 in., thick, would contain 6,900 bricks, calculating the bricks 9 in. long and 4 in. in height to set twelve in; if the bricks are larger a less number will be required. I would not advise you to make the wall less than one brick thick. If you do not fix coping on the top, you could finish it with a brick on edge, pointed with Portland cement. You would require about 2½ tons of lime and 7 or 8 tons of clean sharp sand for mortar; and if under favourable circumstances, a man would do it in nine or ten days. You will also have to calculate for digging the foundation and filling in, and clearing away all rubbish. These items are, of course, approximate, as it is impossible, without being on the spot, to give them exact. Your best plan would be to get an estimate of the cost from a local builder. If the ground is soft, and deeper foundations are required, you could lay them with concrete, formed of five parts of broken stones, and one part of best Portland cement.—M.

Water Motor.—J. R. (*New Brompton*).—The illustrated article is in the printer's hands, and will appear shortly.—ED.

Spectacles for Rear and Front Sight.—T. C. B. (*Cork*).—Will you please write again, sending a rough sketch, if possible; or, failing that, a description of such a pair of spectacles? I am informed there is no doubt they can be made, but in the absence of any indication of their manufacture, all steps in that direction would take the form of experimental work. It would also greatly aid the maker if you were able to say for what purpose you required to use them; not necessarily for publication, but as an aid to the maker. We should be glad to hear more on this subject, as there are, no doubt, many who would like to be the possessors of such a pair of spectacles.—N. M.

Type for Printing.—F. T. (*Rochdale*).—There are many difficulties in the way of your carrying out your laudable desire to make type for yourself. You are, doubtless, aware that types are cast from matrices, each matrix being the work of a skilled artist, who has had to spend many years of labour and study before he is able to produce work such as is required in these days of modern printing. The casting of type is a large undertaking, even for the type-founders themselves, and who possess every mechanical appliance for producing type clean and sharp. If, after reading the above, you are content to try your luck, you may proceed as follows: Procure some type-high type metal, and saw into blocks of the required size, and trim up the sides and edges; and then slightly warm the blocks, and cover the surface intended to be cut with a film of white wax. Next, procure some ordinary writing or foolscap paper, and with a lead pencil draw the letter to be cut—one drawing for each block. Now lay the drawing on the face of the block, and gently rub on the back of the paper; remove paper, and the result ought to be a black-lined letter in *reverse*. The letter is now ready for cutting; take a *sharp* and acute-angled lozenge graver and outline, going over the outline several times until the proper depth is acquired; always cutting towards the left hand for outside outlines, and towards the right for inner outlines, regulating the bias or "side" of the graver *from the outline*, both outside and inside outlines. By observing this last rule you will get nice sharp letters—that is, supposing you handle your graver with ordinary skill. The next thing is to cut away the outside edges; you will find a threaded flat graver, about $\frac{1}{10}$ in. wide, a good tool for this purpose. You may cut in any direction you find most convenient, the main object being to get the reversed letter or figure into high relief. As you are an old subscriber, kindly turn to the first volume of WORK, and study an excellent article on "Lettering," etc. This series of papers has been of great use to many inquirers, and is most valuable to those who desire to be able to form letters correctly, either for painting or engraving. In the first volume of WORK, and running concurrently with the papers on "Lettering," you will also find papers on "Engraving on Metal," which you are recommended to look through.—N. M.

Battery.—B. (*Wirksworth*).—I cannot make out what kind of battery yours is. All you say is that it is a single fluid, with carbon and zinc, and that it is for plating. Are you sure there are no porous pots? If there are none, I suppose it must be a potash bichromate, the charge for which is: 3 oz. of potash bichromate, 3 oz. sulphuric acid to every pint of water, to be used quite cold. If you had only given the name of the cell I should have been certain as to the charge. You say you have taken WORK in for about two years, and yet have not seen a very interesting paper by Mr. Bonney on the subject of Plating in Vol. III., No. 107, page 35, which appeared a year ago last April; also, since then there have been many little tips in "Shop" about battery cells, etc.—J. B.

Dynamo.—W. N. (*Oldham*).—As to where to obtain the information for making a small Manchester dynamo of about the power you mention, you will find the very thing in WORK, Vol. II., No. 99, page 756. Please note that the diagram showing the winding (Fig. 59) was corrected in another number of WORK. A very useful little book on the subject is "The Dynamo; How Made, and How Used," by Mr. S. R. Bottone. Another good book, a little more expensive, is "Electricity in the Service of Man," published by Messrs. Cassell & Company, price 7s. 6d. You have Mr. Croft's book; if you get the information and books I have named, and, as you say, have made a gramme ring dynamo, with an output of 360 watts, I should say you would be able to make any type of machine you please.—J. B.

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Work Bench.—J. N. B. (*Paddington*).—An article is in preparation, which the Editor shall have as soon as possible.—B. A. B.

Paint.—C. J. (*Chester*).—There *was* a paint called Balmain's luminous paint, but I cannot trace it. Perhaps some of our readers may know.—E. D.

Plumber's Joint.—J. J. (*Shadwell*).—Joint-making is the principal thing in plumbing; a man who could make a "wipe joint" properly could soon get his living as a plumber. There is an excellent substitute for a plumber's joint (Fig. 1), sold by Tyler of Newgate Street, that can be fixed single-handed without skilled labour; it forms a perfectly sound, solid, unbreakable, imperishable joint. If the joint is to be made in light lead pipes, place the diminishing linings (Fig. 2) in the pieces, A, B (Fig. 1). If strong lead pipe is used they will not

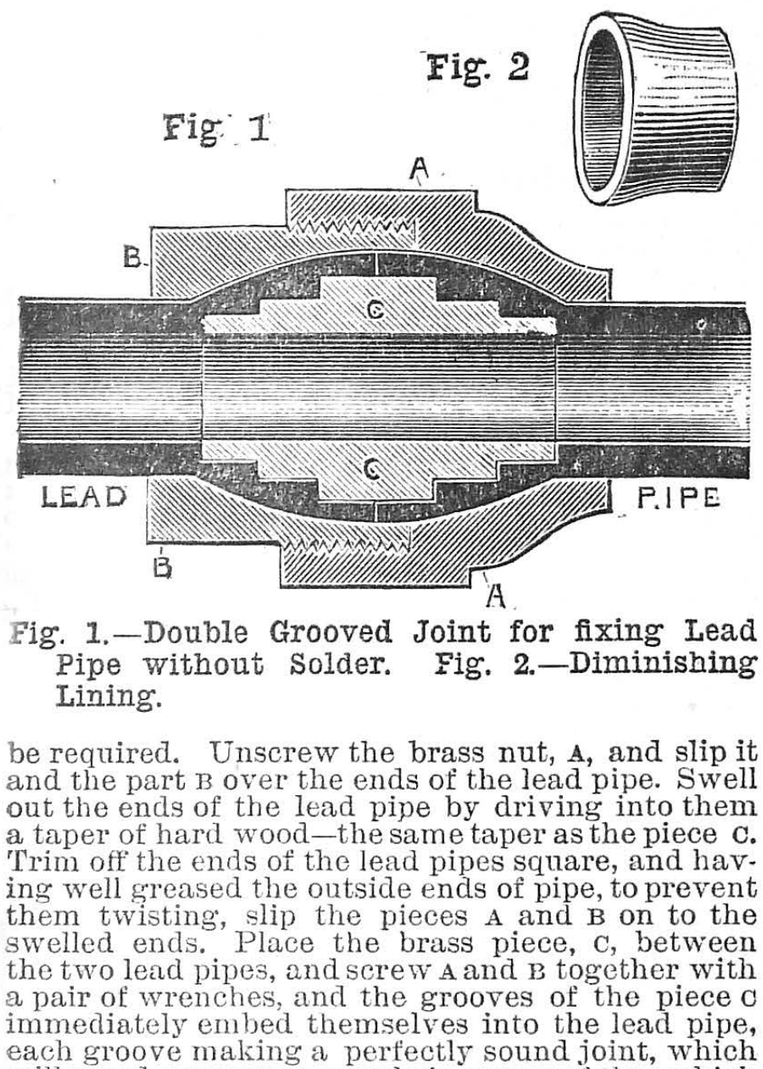
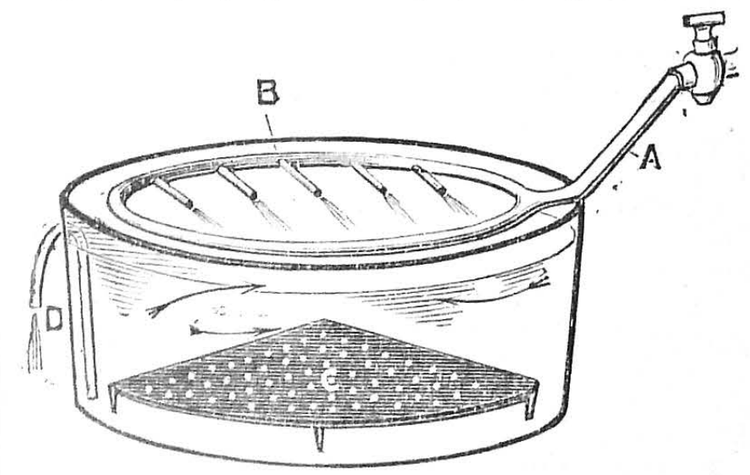


Fig. 1.—Double Grooved Joint for fixing Lead Pipe without Solder. Fig. 2.—Diminishing Lining.

be required. Unscrew the brass nut, A, and slip it and the part B over the ends of the lead pipe. Swell out the ends of the lead pipe by driving into them a taper of hard wood—the same taper as the piece C. Trim off the ends of the lead pipes square, and having well greased the outside ends of pipe, to prevent them twisting, slip the pieces A and B on to the swelled ends. Place the brass piece, C, between the two lead pipes, and screw A and B together with a pair of wrenches, and the grooves of the piece C immediately embed themselves into the lead pipe, each groove making a perfectly sound joint, which will stand a pressure greatly in excess of that which the pipe itself will stand.—E. D.

Casement Windows.—BOOKCASE.—It is impossible in "Shop" to give directions for making casement windows that shall also include the modes and methods of mortising and the other operations involved, together with tools needed. Our querist gives a large order for "Shop," but an article shall be written and sent to the Editor, and he will, if he approves of the article, insert it as soon as possible.—B. A. B.

Wetting-Trough.—A. W. (*No Address*).—If the position of the jets is altered, so that the water plays at a different angle, the prints will revolve. The better plan would be to fix the jets in a ring just over the surface of the water, and playing down into it. In the present form of machine there would be a stoppage of the current on the side opposite to the jets. Even the straight row of jets as shown in diagram, fixed at one end of the trough, and playing at an angle of 45 degrees to the



Wetting-Trough—A, Water Supply; B, Jets; C, False Bottom; D, Syphon.

bottom, would in all probability cause a satisfactory revolving motion, but there is no doubt but that a *circular* washing-trough with the jets above keep the prints better apart, and wash them better than any rectangular vessel with a circular current can possibly do, as the angles of the vessel offer sufficient resistance to the free movement of the prints, so that they are apt to stick together. The above is a good design.—D.

Bicycle Chains.—E. C. M. (*Ipswich*).—E. C. M.'s idea is an impracticable one in its application to cycle driving. Assuming that *in an air-tight* case the force applied to A would make B revolve with sufficient power to drive the machine, the case could not be made air-tight, neither could it be made oil-tight. The shafts must pass through one side of the case in order to carry the wheels on their ends. They could not be fitted by any mechanical means perfectly air-tight, therefore the principle of the pump acting in an air-tight casing is wanting. The joints referred to might be fitted, at first, very nearly air- and oil-tight, and might remain so for a time if applied on a stationary and strongly got up piece of machinery, but in a cycle the case is entirely different. It is at best a fragile machine, liable to twists and strains which at once affect all nicely fitted bearings, and necessitate their frequent adjustment. Even were all the conditions of the vacuum pump present, I am not prepared to say that the arrangement shown by E. C. M. would have the power necessary to drive the machine.—A. S. P.

Silvering Copper Tubes.—ELDRED writes:—"I want a simple method of doing the above kind of work. The tubes are 22 in. long and $\frac{9}{16}$ in. in diameter." He further says: "Give me an idea of the kind of vessel to do it in." It seems to me that ELDRED has in his mind, at least, in the last sentence, some idea of electro-plating; if so, my advice is, "Don't." If the number of tubes which he has to silver are very few, then I can assure ELDRED it would be a most expensive process, and would not be a commercial success. I venture to say that at any one of the manufacturers of plated goods in Birmingham he could get his work done for a fraction of the cost he could do it at, and a great deal better. Electro-plating in its simplest form as a mere experiment is easy, but to produce finished work requires a somewhat expensive plant. I would repeat that my advice is, "Don't." But, supposing by his "simple method" he does not refer to electro-plating, but some other: then I think there is a possibility of his doing the work himself—that is, providing the said tubes are not to be subjected to hard wear. I can give ELDRED the method used by one of the largest manufacturers of scientific instruments in Birmingham for the kind of work I have indicated, which may suit ELDRED, seeing it is a simple and also an inexpensive method. It is used for silvering scales, dials, and such kind of work as is not liable to rough usage. First make the tubes perfectly clean, and polish with emery-paper; they should then be washed, so as to remove any adherent dust. See that they are perfectly free from grease. In a glass bottle make a strong solution of nitrate of silver, in the proportion of 60 grains to an ounce of distilled water. When dissolved, add table salt—chloride of sodium—in small quantities and slowly; a precipitate of chloride of silver will be formed. Continue to add the salt until no further precipitation takes place. This must be allowed to settle, and the chloride of silver separates by filtering. Now add three times by weight of cream of tartar; wet the tube and put a little of the mixture on it, and rub with a piece of cork, when a thin film of pure silver will be deposited on the tube. When the tube is covered, wash it in water, and dry in sawdust. As the film of silver is exceedingly thin, it will be necessary to protect it by a colourless lacquer or mastic varnish. This is a simple method, and one, I trust, that will answer ELDRED'S purpose; but if the work must be electro-plated, I will give a further answer, if requested.—O. B.

Sharpening Plane-Irons.—J. MCC. (*Lochwinnoch*).—Your machine is an ingenious one; but I do not think the round-edged wheel would sharpen so truly as the hone held in the hand. A revolving wheel, though suitable for grinding, is hardly good enough for sharpening.—J.

Water Motor.—A READER OF "WORK."—This is rather vague, because you might mean a water wheel, or a turbine, or a pressure engine. In either case several drawings would be necessary. You should state the nature of the water power available, the conditions under which it must be used, and so forth.—J.

Iron Shedding—Roofing.—"Iron Roofs and Bridges," by Prof. Ritter (Spon), is a high-class work. Elementary works are "Designing Wrought and Cast Iron Work," by Prof. Adams (Spon). Anyone can master these books by Prof. Adams.—J.

Property in Chancery.—A LABOURER.—Various lists are published of the names of those entitled to such property. Perhaps that most suited to your purpose is issued (price 1s.) by Messrs. Harrison, St. Martin's Lane. This is stated to contain names collected from the *London Gazette*, and is published at intervals of, I believe, ten years. There are plenty of offices at which information is professedly given on this subject on payment of an inquiry fee, such as Culmer's, Southampton Buildings; Preston's, Great College Street, Westminster; Read's, Fleet Street; Bernardi Brothers, John Street, Bedford Row; and Dougall's, of which I have not the address, but it is well-known, and "Dougall's Next of Kin Office, London," will find it. Lists are published at most of these offices; but before LABOURER spends his money and time on making researches, he should be warned that of those who believe themselves entitled to property through unknown ancestors, there are few indeed who ever succeed in establishing their claims; whilst the majority, seduced by delusive dreams, neglect their business, which would have brought them certain prosperity, and sacrifice their happiness in life for that "hope deferred which maketh the heart sick."—S. W.

Emigration.—FEMALE EMIGRANT.—There is a "School for Household Management, with Special Facilities for Training for Colonial Life," at Miss Mitchell's, Fryerne, Caterham.

Glockenspiel.—W. J. P. (*Birkenhead*).—The glockenspiel proper consists of a set of eight or more clock bells, mounted on a central spindle, which is inserted in a wooden handle. They are held in one hand, and played by being struck with a small metallic beater held in the other (Fig. 1). They may be of any size or number, so long as they are in tune. The instrument to which you most probably refer is the "metallaphon," or metal harmonica, which, in its simplest form, consists of a wooden box without a lid, on the top edges of which are laid on a woollen cord flat bars of metal (Fig. 2). These bars are kept in position by means of nails or round-headed screws, which pass through holes in the plate and are driven into the wood. These holes must be large enough for the screws to pass easily through, so that the plate may lie loosely; otherwise, if it is fastened down in any way tightly the sound will be "damped." Of course, you can make an instrument of any size and number of notes you

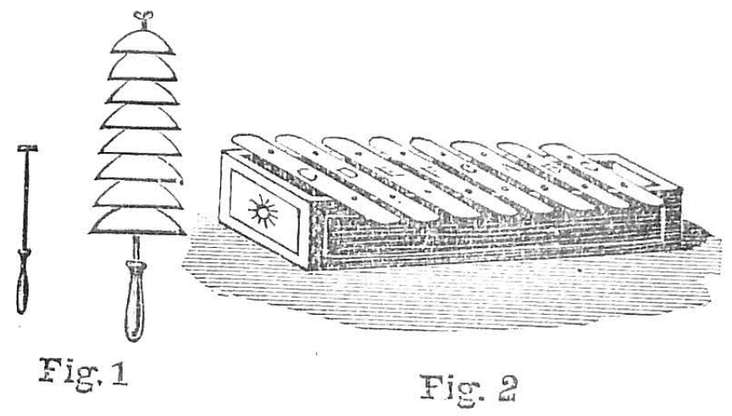
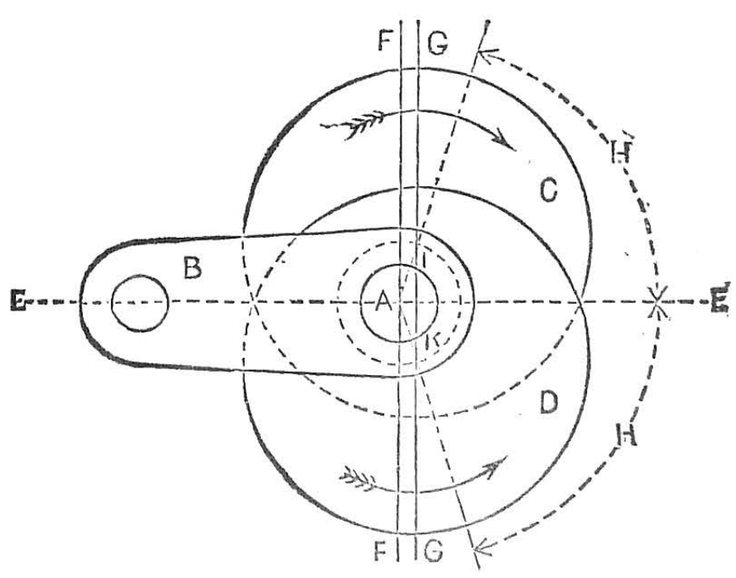


Fig. 1.—Glockenspiel and Beater. Fig. 2.—Metallaphon.

like, and either with or without semitones; if semitones are employed, it is usual to place them on another row at the back of the first. The metal used may be either iron or steel; the latter gives much the best tone, but, of course, is much more difficult to work. The note C on the ledger line below the treble stave is produced by a bar about 6 in. long by 1 in. wide and $\frac{1}{8}$ in. thick; but this is only approximate, as the pitch will vary with metals of different densities. Care must be exercised in the tuning, as, if the bars are made too short and, consequently, too sharp or high in pitch, they cannot be flattened or lowered again. The best instruments of this kind, as used in orchestras, consist of two octaves or more, and are played with a keyboard like a piano.—R. F.

Slide-Valve.—MANEO.—I assume that the rod of whichever eccentric is operating, the valve has its end opposite the end of the slide-valve rod, so that no allowance is required to be made for leverage, or for reversing the direction of motion by intervening weigh-shafts; then, having determined the weight of lead to be given to the valve, the eccentrics are set as shown in the accompanying diagram. A is the end of the crank-shaft, B the crank, C the forward eccentric, and D the backward eccentric. E E is the centre line of the main cylinder and piston-rod. The crank is shown in line with the piston-rod, and therefore on a dead centre, in which position the slide-valve, *if it had no lead*, would be at mid-stroke, and the centre of the eccentric would lie practically upon the line F F drawn through the centre of the crank-shaft, and at right angles to the line E E; it would be at the point of intersection of this line with the dotted circle, which shows the path of the eccentric centre when in motion. The lead is the distance the valve



Slide-Valve Eccentrics.

is ahead of its mid-position when the crank is on the dead centre. Draw the line G G parallel to F F, and at a distance from it equal to the required lead; then the points of intersection, I and K, will be the required centres of the eccentrics. The angle H may be found from trigonometrical tables, if desired, as the lead divided by the radius of the dotted circle—half the throw of the eccentric—is its cosine. The lead will be the amount of lap plus the width the valve is required to be open at the commencement of the stroke; thus, if we want one-eighth of an inch opening at the start, and there is a quarter-inch lap, the lead will be three-eighths of an inch.—F. C.

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Drilling Holes in Glass.—G. M. R. (*Rastrick*). The only practical method of drilling holes in glass or earthenware is to use a splinter of diamond set in a tin socket; it *can* be done with a highly-tempered steel drill, using turpentine as a lubricator, but it takes a long time, and there is a far greater liability of a fracture; if you have much to do, I should certainly advise you to buy or make a diamond drill and drill-clock. You say you have been a reader from the first; perhaps you have overlooked an article upon "Drilling Glass and China" in No. 53 of WORK. Refer to that, as it fully describes the process, and also tells you how to make the tools or where to buy them; but if there is any special point you need further information upon, I shall be glad to help you if you write again.—W. E. D., JR.

Bichromate Battery.—STUDENT.—I am only too pleased to be of some assistance to you in your studies. As bichromate of potash is anything but a perfect depolariser, its use for this purpose in galvanic batteries does not conduce to their constancy. The bichromate of potash battery, in any of its forms, is by no means a constant generator of electric current. In its single fluid form, as the "bottle bichromate," it is very erratic. By the employment of a very large negative surface of roughened carbon plates—such as three large carbon plates to two small zincs—the single fluid cell is slightly improved, but is still very inconstant, with its violent rush of current at an E.M.F. of 2 volts, and the subsequent rapid fall to 1·40 volts in ten minutes. This fall is due to the imperfect depolarising properties of the solution, and a consequent formation of a film of hydrogen on the negative plates. This film not only increases the internal resistance of the cell, but also opposes to the zinc a counter E.M.F., since hydrogen is positive to zinc. The relation of this battery to the Bunsen in point of constancy is clearly shown in a table published in No. 3, p. 42, Vol. I. of WORK. This table shows the results of tests made with Bunsen and bichromate of potash cells, and shows that the bichromate of potash cell failed rapidly during the first two hours, whilst the Bunsen remained fairly constant for nine hours. In experiments made by Mr. J. T. Sprague, the Bunsen gave a current of 12 chemics at starting, and yielded the same after two hours' work; a Daniell's cell yielded 6·8 chemics at the start, and 7 chemics at the end of two hours; the double cell double fluid bichromate yielded 7·3 at the start, but fell to 2·1 at the end of two hours; while the single fluid bichromate was worse still, starting with 12 chemics, and falling to 1·1 at the end of two hours. The bichromate of potash battery is therefore unsuitable to electro-plating work. I should advise you to get Mr. Sprague's book, "Electricity: Its Theory, Sources, and Application," and study this subject for yourself there. The price is 15s., so you would have to study it at a library. I do not know of a cheap book on all the subjects you name, but the price list of Messrs. Whittaker & Co. will give you the names of several cheap books, each dealing with one subject alone. The nearest approach to the book you desire is "Electricity in the Service of Man," published by Messrs. Cassell & Co.—G. E. B.

Covers for WORK.—BOOKBINDER.—Messrs. Cassell & Co., London, E.C., will supply you with these.

III.—QUESTIONS SUBMITTED TO READERS.

*** *The attention and co-operation of readers of* WORK *are invited for this section of "Shop."*

Telephone Connection.—A. S. B. (*Loughborough*) writes: "I am desirous of having some arrangement on the outside of a building by means of which a man at work may be able to tell if the bell on a telephone inside the house has been ringing. I should be much obliged for sketch showing suggestion."

Machine Wheels.—Cog writes:—"Will any reader of WORK tell me of the best book on wheel-work for machines, or furnish me with information as to the best methods of wheel gearing?"

Bicycle Cement. T. B. (*Great Orton*) asks for the address of the makers of Snell & Brown's Octopus cement.

Fretwork Exhibition.—NEMO writes:—"I should feel greatly obliged if any reader would kindly let me know of any exhibition in which fret-work can be exhibited."

Folding Garden Seat.—T. W. (*Cardiff*) writes: "Will some reader of WORK kindly give me instructions how to make a folding garden seat of pitch-pine wood, with best way of cutting same to save timber?"

Stained Glass Designs.—J. B. (*Moss Side*) writes: "I should be much obliged if any reader of WORK could give me an idea of where to get some good designs for stained glass, both geometrical and leaf-work. Could anyone supply me with a few, and at what price?"

Picture Framing.—J. P. (*Chester-le-Street*) writes: "On page 126, No. 161, E. B. (*No Address*) says 'he could not get through half of his work if he had to bother with corner cramps.' Would he or any other reader tell me which is the best way to fasten the ends together?"

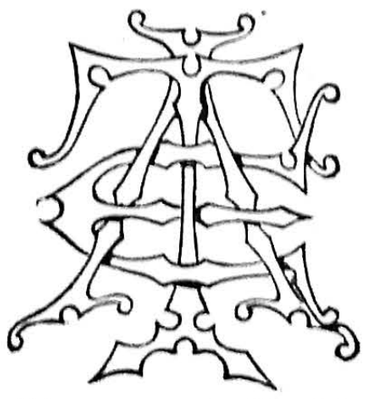
Glass Case for Model Ship. E. C. (*Leyton*) writes: "I should be greatly obliged if some kind reader would give me a detailed design for above. Dimensions, 2 ft. 4 in. long, 8 in wide, 1 ft. 4 in. high."

Engraving on Metal.—NELSON writes:—"Will W. J. B. (*Londonderry*) kindly oblige NELSON with his address? He wishes to write to him. A post-card will find NELSON, Duke's Town, Tredegar."

Vanguard Paint.—A. F. (*Luton*) writes:—"Can G. H. (*Leeds*), *re* answer to J. W. S. (*Guernsey*) (see No. 163 of WORK), kindly tell me where I can get the paint called 'Vanguard' paint, about the price, and if in colours or not?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

A. E. T. Monogram.—J. B. writes, in answer to SHAMROCK (see WORK, No. 156, page 830):—"I think this monogram will in every way fit the shield you mentioned."



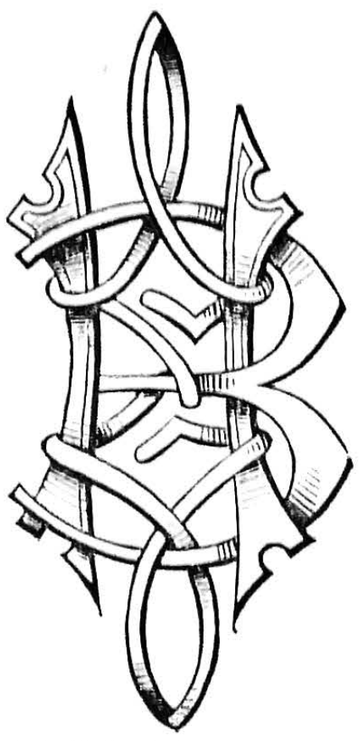
Monogram for Shield.

Mitre Cutting.—G. E. W. (*Swanley*) writes to J. A., E. B., and SENTINEL:—"I have used Booth's Registered Mitre Cutting Machine for twelve months, and find that it is quicker, quite as accurate, and does not require so much practice as a plane, etc. My usual method is to cut the mitres first, and then to shoot them with the machine; as for the corner cramps, they are awkward at first, but only require practice. I certainly would not be without them now."

Surveying.—M. (*Bishop Auckland*) writes to C. J. T. (*Devonport*) (see No. 161, page 126):—"One of the following books will perhaps suit you. 'Surveying and Levelling,' by W. F. Stanley, 7s. 6d. (Spon, Strand); or, 'Land and Engineering Surveying,' by T. Baker, 2s."

Pinhole Photography.—M. (*Bishop Auckland*) writes to H. A. H. (*Tunbridge*) (see No. 161, page 126):—"You can use any camera, substituting a thin metallic plate or card for the lens, through which the hole is made. A long exposure is required. See page 131, Vol. IV. of WORK."

H. E. B. Monogram.—W. J. B. (*Londonderry*) writes to WIN (see No. 155, page 814):—"I enclose sketch of monogram H. E. B."



H. E. B. Monogram.

Pinhole Photography.—A. G. (*Sheffield*) writes to H. A. H. (*Tunbridge*) (see No. 161, page 126):—"Yes, any camera will do. Unscrew the lens from the mount, put a thin visiting-card down the diaphragm slot, and make your pinhole through centre. The nearer the dry plate is to the pinhole the wider the angle of view, and smaller the picture; the further away the dark slide the narrower the angle of view, but the objects in the picture will be larger. Of course, you will have to give a very long exposure—say, five minutes—for outdoor subjects."

V.—LETTERS RECEIVED.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—J. W. (*Darlington*); H. J. C. (*Compton Bishop*); R. M. (*Glasgow*); G. M. (*Sunderland*); WORKER; FACTORY LAD; CHEMICUS; E. S. (*Stockwell*); BUCKEYE; W. H. T. (*Westminster*); R. H. A. (*Forest Hill*); S. P. (*Hyson Green*); G. B. (*Frodsham*); S. P. (*Sunderland*); W. B. (*Golcar*); H. A. H. (*Wananesa, Manitoba*); WIRE; G. C. S. (*Inverness Gardens*); GREENHOUSE; E. A. (*Brompton*); T. G. (*Kettering*); W. L. J.; J. S. (*North Biggart*); J. E. W. (*Islington*); R. B. (*Ashton-under-Lyne*); J. F. (*Pimlico*); C. & P. (*Leicester*); REG.; W. M. J. R. (*Bristol*); D. B. (*East Grinstead*); G. D. C. (*Brixton*); J. B. (*Glasgow*); J. N. (*York*); W. R. (*St. Albans*); G. H. (*King's Langley*); MODEL; P. E. B. (*Birkenhead*); A. H. G. (*Hampstead, N.W.*); P. B. A. (*Liscard*); R. F. (*Thirsk*); J. G. L. (*Merthyr Tydfil*); W. B. (*Balham*); C. C. (*Glasgow*); W. C. (*Plaistow*); T. D. (*Ipswich*); F. W. P. (*Battersea*); G. C. (*Aberdeen*); H. W. (*Bartholomew Road*); H. J. (*Tidswell*); D. D. (*Leven*); G. F. C. (*Southampton*); A. G. (*Lambeth*); G. S. (*Banff, N.B.*); G. E. (*Notting Hill*); W. B. (*New Brompton*); F. J. K. (*Upper Holloway*); R. W. K. (*Bradford*); NEMO; D. D. (*Morda Vale, W.*); VILLAGE SHAVER; S. C. C. (*Manchester*).

"WORK" PRIZE SCHEME.

SECOND COMPETITION.

THE Editor of WORK has the pleasure of calling the attention of his readers to the Second Competition under the Prize Scheme, which so many readers of WORK have thought to be a suitable sequel to the late WORK Exhibition.

The subject for the present competition is, like that of "The Cycle," one that appeals to the whole of our readers, young and old alike, and places them, therefore, at equal advantage.

It will take the form of a suggestion for

A USEFUL ARTICLE FOR THE HOUSEHOLD.

For the three best suggestions for a new domestic appliance, household article, or labour-saving tool of general utility, the following prizes will be awarded—

First Prize, £3;
Second Prize, £2;
Third Prize, £1.

CONDITIONS AND RULES OF THE "USEFUL HOUSEHOLD ARTICLE" COMPETITION.

ALL Descriptions to bear the WORK Prize Coupon, cut from one of the numbers of WORK in which the Prize Scheme is announced.

Each Description to be signed with an original *nom de plume*, and to have the writer's real name and address securely attached to the manuscript in a sealed envelope.

Each Suggestion should be fully described in respect to its purpose, construction, and working, and, where possible, should be illustrated with a drawing of the article itself and its various parts to elucidate the description.

A Suggestion not illustrated will have an equal claim in the competition provided the description be sufficiently in detail to convey a full idea of the article suggested.

In the work of judging regard will be had to the practical nature and utility of the suggestions, and their prospective popularity.

The Prize Suggestions and Drawings, and any others, to be published, if desired by the Editor, in WORK, but the copyright thereof to remain with the authors.

Copies of MSS. and Drawings to be retained by the competitors, as in no case can the return of MSS. be undertaken.

The Editor of WORK will supervise the judging of the Suggestions, and the selection as determined upon is to be final.

All manuscripts intended for the "Useful Household Article" competition must be addressed to the Editor of WORK, c/o Cassell & Co., Ld., Ludgate Hill, London, E.C. They must reach him not later than SATURDAY, JULY 30, endorsed, "Useful Household Article" Competition.

NOTICE TO READERS.

Next week's issue (No. 173) will contain special papers on

RUSTIC VASES AND BORDERING;
BRIDGE MODELLING IN CARDBOARD;
A THREE-CORNERED CHINA CABINET,
etc. etc.

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Victor Supply Co., Grimsby, sell Mail-cart Wheels and Parts. [15 R

Caplatzi's Cheap Technical Collections embrace most things electrical, optical, mechanical, chemical, photographic, models, materials. Catalogues, 2d.—Chenies Street, Bedford Square. [9 R

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Picture Moulds.—15 to 25 per cent. saved. Send for wholesale list, one stamp.—DENT'S, Importers, Tamworth. [12 R

Bicycles.—The Manufacturers' London Agency offers several makes of Safeties very cheap.—Call 100, Houndsditch, London; or write to TOOL AND MACHINERY REGISTER, Colchester.

Tricycle or **Bicycle** offered in exchange for good modern Lathe; Britannia preferred.—Address as above.

4,000 Amateurs' new and second-hand engine lathes, drilling machines, and all kinds of engineers' and mechanics' tools.—Details in Monthly Register, as above. [1 S

Wanted, 1st, 2nd, and 3rd volumes of WORK, bound.—Address, JAMES HUXTON, 2, St. Paul's Street, Newton, near Hyde, Chester. [2 S

Lettering and Sign-Writing made Easy.—Also full-size diagrams for marking out eight alphabets, post free, 1s. Fretwork and stencil list free.—F. COULTHARD, Darlington Street, Bath. Note.—100 Decorators' Stencils (60 large sheets), varied useful designs, 2s. 6d. [3 S

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